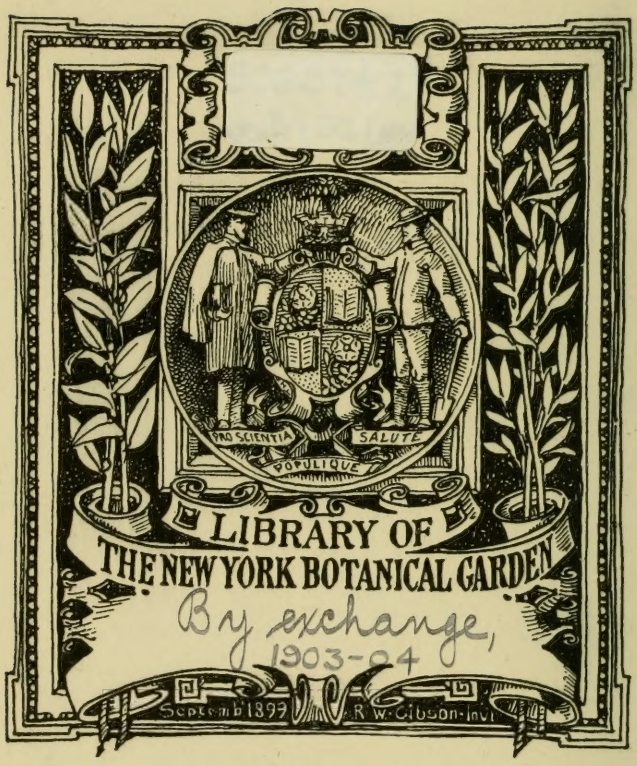
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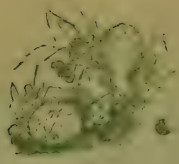

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A Journal of Western Ornithology.

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AMORPHOPHALLUS RIVIERI

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NATURE STUDY.

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Jack's Cousin.

BY WILLIAM H. HUSE.

Jack-in-the-pulpit is a queer fellow, perched aloft under his sounding board of striped green, and he has many singular relatives. The wild calla of New England swamps, floating in the cold bog water and sending its roots down to the mud below, is more beautiful than peculiar, reminding one of the larger and more showy callas of pot and conservatory. The long, green arrow arum is less conspicuous and not so easily seen except by the experienced observer who knows just what to look for. The skunk cabbage is the strangest of Jack's relatives that grow wild in this section. Pushing its way up in early spring, often through snow and ice, it humbly heralds approaching spring and is welcomed by the pollen gathering bees. Its hood-like spathe and early appearance make it welcome to the botanist; its odor renders it repulsive to the dainty.

It it not, however, a native cousin that is the subject of this sketch, but a stranger from tropical lands. Obtainable from florists that keep the odd as well as the beautiful,

the *Amorphophallus rivieri* is well worth a place in the garden for the size of its flower as well as the beauty of its foliage. The specimen shown in the frontispiece sent up its one leaf in the summer of 1902, on a petiole two inches in diameter at the base and about two feet high. At the summit the petiole divided, as usual, into three branches and then subdivided again and again, with leaflets so numerous as to completely shade the ground. The entire leaf spread over a circle four feet in diameter.

Late in the winter the bud at the summit of the corm, which was nearly eight inches in diameter, began to grow rapidly. In a month it showed that a blossom and not a leaf was in prospect. When fully grown and open, it looked as represented in the illustration. It lacked but half an inch of being four feet from the top of the corm to the summit of the dark purple spadix. The spathe, rich purple in color, spread out nine inches in width and was nearly eighteen inches in length. The mottled stem, similar to that of the leaf, justifies the common names of snake palm and snake lily. The odor of the blossom, which resembles that of decayed meat, is useful in its native country to attract flies, which reciprocate by fertilizing the pistillate flowers.

The Ant's Toilet.

A naturalist has been making observations on the toilet of certain ants, and has discovered each insect goes through most elaborate ablutions. They are not only performed by herself, but by another, who acts for the time as lady's maid. The assistant starts by washing the face of her companion, and then goes over the whole body. The attitude of the ant that is being washed is one of intense satisfaction. She lies down with all her limbs stretched loosely out; she rolls over on her side, even on her back, a perfect picture of ease.—*Pittsburg Dispatch.*

A Chance Acquaintance.

BY E. H.

While I have always believed that eyes were made for seeing, and that it was necessary to keep them open to behold the wonders and beauties of nature, I have never "watched out" for "bugs and worms."

As a small child, an introduction to some entomological specimens produced such lasting impressions that I never cared for further acquaintance with the insect world, except as some exceptional beauty or oddity came to my notice. However, last year, while looking at a milkweed plant upon our premises, and threatening it with destruction, I saw upon it a caterpillar. Just at this moment, there happened to pass one of my friends, an authority upon entomology, who told me that there was an interesting study before me, without the trouble of a feeding-box or special attention to insect guests.

The watching for a short time was rewarded by the development, through the various stages to the adult form, of the Monarch butterfly—*Anosia plexippus*.

As the wings of the butterfly unfolded, after the beautiful gold-studded chrysalis was left behind, my desire to see a repetition of the miracle so increased that later I traveled miles to find another caterpillar. But the season was too far advanced (or my eyes not sharp enough) for the discovery of a second one.

One day, while upon this errand, I chanced to see a sassafras bush, and feeding upon it a threatening creature, the "Bugaboo of the Spicebush," which so frightened the old farmer of William Hamilton Gibson's acquaintance, as related in "Sharp Eyes."

My discovery afforded me great pleasure. The butterfly which hides in the most beautiful chrysalis known, and

one of the most startling caterpillars of our locality, were interesting specimens, and I determined to study this one.

I found the prize Thursday, Sept. 25, 1902, and on the following Sunday, when I went for fresh supplies, I returned with three more caterpillars in less mature stage. This form of the larva, which is well illustrated in Holland's Butterfly Book, was smooth, somewhat slimy, and dark brown in color, with white markings; its close resemblance to the excrement of birds serving as an excellent example of protective coloration.

In three days one of these smaller caterpillars had changed to a beautiful wood brown, with blue spots along the sides. In thirty-six hours more, the coat was becoming greenish, the small blue spots along the sides edged with black making a beautiful combination of color; on the enlarged part of the body, large eye-spots, which probably serve to frighten away its enemies. The upper part of the body is so swollen and marked as to resemble a huge head, and is further ornamented with yellow scent organs, which it can protrude at will. This was similar to the condition in which I had found the first caterpillar, which at this time, just a week after discovery, was turning yellow.

The leaves of the sassafras bush which was the home of the larvæ were rapidly dropping off, and it was difficult to find food enough for a supply, but none of the creatures showed at any time a voracious appetite.

Ten days after discovery, there came the first noticeable change in condition of Number One. It became very restless, emptied the alimentary canal of much matter, and grew exceedingly yellow, the mimicry of the color of the fading leaves being very marked.

Oct. 6, on the morning of the eleventh day after the caterpillar came into my possession, it suspended itself for the winter, having bound itself with a girdle which hung from

the stem of a leaf. The extremity of the body was attached also to the [branch of the bush] twig.

Two days later, Oct. 8, about 9 o'clock in the morning, we watched the old coat slipped off the suspended creature; a process attended by evident great exertion. The old coat split first at the back, near the head, and was followed by stretching of the body and further breaking apart of the old garment, which soon was wrinkled in tighter and tighter folds, until the whole body was outside of it. Such twisting and turning and pulling and stretching was painful to witness. Drops like perspiration stood all over the body, until the covering, with their disappearance, hardened.

This secretion probably acted as a lubricant, but it all added to the appearance, that changing the fashion of one's garments in the insect world is harder work for the subject than a visit to the dressmaker or tailor in ours, and was not favorable to the wish often heard expressed that our garments might grow with the wearer and save buying and mending.

The chrysalis looked like a dried leaf—an illustration to the end of Nature's ability to protect her children through imitation. The color was yellowish brown, darker on the ridge along the back, which looked like the midrib of a rolled leaf.

Two of the other caterpillars passed through all the stages described. About 9 o'clock in the morning of Oct. 17, occurred the final change of Number Two, which resulted in a much smaller chrysalis than the first one. The natural inference was that this was due to less nourishment and the confinement, but a different theory might be substituted, for, on May 27, 1903, there was in or on my box a peculiar-looking fly, later identified as an ichneumon, and after investigation the smaller chrysalis was

found to have a small, irregular opening, which, in all probability, accounted for the unexpected visitor.

Caterpillar Number Three was given away just as it was about to enter the chrysalis stage. Number Four lingered until Oct. 30, having made no perceptible growth, and with very little change in color, for many days.

Although all leaves disappeared from the bush on which the larvæ were found, some others were obtained in sheltered places and furnished up to the time of the death of Number Four; but if the season at their birthplace was ended, it is quite likely that other conditions were unfavorable to their existence.

No attempt at concealment was made by the caterpillars at any time, but in one instance a web was spun which resulted in a mat which was slightly smaller than the leaf surface to which it was attached, thus making a sort of spring bed, but the leaf edges were not drawn together.

On June 2, 1903, came the climax in this life history, for, noticing that the chrysalis was becoming a dark color, the first change since Oct. 8, I removed it from its ventilated glass-fronted box to a place where closer observations might be made.

Much to my surprise, within half an hour, I saw, where my chrysalis had hung, a little black bunch of loose ends, like bits of silk. A second glance proved the suspicion that a butterfly had arrived. For perhaps fifteen minutes it remained on the chrysalis, or on the leaf stem to which it was attached, then it removed to an adjoining leaf, and within half an hour the wings were fully expanded; but it was fully two hours later when the big black beauty used them to fly to the open but screened window.

As the caterpillar masquerades in the guise of a dangerous individual, so, later in life, the insect passes, unconsciously, perhaps, under the different names of Papilio

Troilus, Euphræades Troilus, the Blue Swallow-tail and the Green-clouded Swallow-tail.

But whatever its name, the butterfly is a beautiful one, with the large black wings heavily dusted with scales of the color in dispute, and further adorned with bright orange spots; also with a row of marginal spots which are pale above, orange beneath, at least on the hind wings, which have also an inner series of orange spots.

A Summer Day.

[Alexander Hume was a Scotch poet, of Queen Elizabeth's time born in 1557, He studied law in his youth, was often at court, and lived four years in France, but later became a stern and even gloomy Puritan clergyman, dying a minister at Logie in 1609. Gloomy as he was in religious matters, he cherished a fresh and wholesome feeling for outdoor life, as appears in his now almost forgotten poem, "A Summer Day," from which the following brief extract is here reproduced with the ancient spelling.]

Up braids the carefull husbandman,
His cornes and vines to see,
And euerie tymous artisan
In buith worke busilie.

* * * * * * * * * * * *

Ye shadow of ye earth anon
Remoues and drawis by,
Syne in ye east, when it is gone,
Appears a clearer skye.

The passenger from perrels sure,
Gangs gladly foorth the way;
Briefe, euerie liuing creature
Takes comfort of the day.

* * * * * * * * * * * *

Whilk soon perceiue ye little larks,

Ye lapwing and ye snipe,
And tune their song like Nature's clerkes,
O'er meadow, muir, and stripe.

The time sa tranquil is and still,
That na where sall ye find,
Saife on ane high and barren hill,
Ane aire of peeping wind.

All trees and simples great and small,
That balmy leife do beir
Nor thay were painted on a wall,
Na mair they moue or steir.

Calme is the deepe and purpour se,
Yee smuther nor the sand,
The wals that woltring wont to bé
Are stable like the land.

"Listen to the Mocking-Bird."

(Title of Alice Hawthorne's Song).

BY STEPHEN D. PARRISH.

The Mocking Bird, which, in extent and variety of vocal powers, stands unrivaled by the feathered songsters of the world, is peculiar to the Occident; inhabiting considerable area of North and South America, having been traced from New England to southern Brazil. They are, however, much more numerous in our states south than north of the Delaware. Generally migratory north of that beautiful river, and resident, to a great extent, to the south thereof.

Some time ago I noticed a few lines in one of the New England papers seemingly expressing surprise at the fact that a Mocking-bird (one!) had been seen as far north as Waterbury, Connecticut, and the lady writer concludes: "I have known of the bird (mocker) nesting near New Haven, but have not heard of its coming as far north as this," i. e., Waterbury, and "I shall watch for its coming

next summer." If she does, anywhere in New England south of Aroostook, she will find the bird, or, according to Audubon, at least, it ought to be found, mingling mayhaps in some remote mountain glen, its soulful song with Longfellow's "Sweetly over the village the bell of the Angelus sounded."

Even in the land of Evangeline was found this pert, happy bird—so said, at least, in the days of George II., i. e., "The Mocking-bird." The Mimus polyglottus, or, as written by Charleton, Ray and Catesby, the Mock-bird, and by Bonaparte, Mocking-bird, and passing "critical inspection" by all the world's best ornithologists, is still, as Audubon says, "accepted king of all Earth's choir," and Wilson, "The elfish Mocker swells." Every poet who has essayed to convey in words the "emotions felt" has been about as successful as a Master's description of Praxiteles' Cnidian Venus. They are all (or may be) grand, delightful and enchanting. Enough of this—"souled emotions" cannot be pictured, cannot be circumferenced with words.

The tradition of the American indigenes, wrapped in the beautiful and sea-shell-sounding language of the Wako, as translated by our Charles Winterfield, fails to give a satisfactory negative from the original, and that is saying a "good deal." Maurice Thompson, naturalist and State Geologist (Ind.), author of "Byways and Bird Notes," portrays very powerfully the "song powers" of this "Kikewee of the Delaware," in his description of its "Sinking Song." The Editor may be able to get the book for any one wanting it. The author is now dead. I don't recall the publisher's name. The best of all I have yet seen along the line indicated was written by Richard Henry Wilde, born at Baltimore in 1789, member of Congress from Georgia, held the professorship of law in the University of Louisiana, and died at New Orleans

in 1847. He was an extensive European traveler, and while abroad, and doubtless after listening to the nightingale, or "philomene of Sussex," wrote these fourteen lines:

TO THE MOCKING-BIRD.

Wing'd mimic of the woods: thou motley fool,
Who shall thy gay buffoonery describe?
Thine ever-ready notes of ridicule,
Pursue thy fellows with jest and gibe:
Wit, sophist, songster, Yorick of thy tribe.
Thou sportive satirist of Nature's school;
To thee the palm of scoffing we ascribe,
Arch-mocker and mad Abbot of misrule:
For such thou art by day, but all night long
Thou pour'st a soft, sweet, pensive, solemn strain,
As if thou didst in this thy moonlight song
Like to the melancholy Jaques complain,
Musing on falsehood, folly, vice and wrong,
And singing for thy motley coat again.

I imagine that Mr. Wilde was then longing for his old haunts amid the oleanders of the Mississippi. Be that as it may, he certainly knew America's (ought to be) national bird, which it is *de jure*.

The Bonaparte mentioned in the former part of this article was Charles Lucien, Prince of Canino, and a brother of the great Napoleon. This Prince Lucien, with the assistance of our fellow-American, J. J. Audubon (by birth a Frenchman), compiled and wrote the "Geographical and Comparative Ornithology of Europe and North America." A pretty lengthy title-name for a book, but no more so than that of the Prince, if you stretch it out. Who has to the world rendered the most loving, and of course the greater, service for humanity—the brother, a naturalist, who dignified the science of Ornithology with his labor, station, fortune and genius, and whose memory is *historied*, so to speak, in the song of the Mocking-Bird, or the brother, as

strategist, whose history is '*Waterlooed*' in the blood of a nation? If the editor will not answer this question, I suggest that you ask Prof. H. C. Wright of Corry, Pa., to do so. He can, if he will, give the answer of a psychologist, and only from that view-point the services indicated can be measured. This bird not north of the Delaware, to sing,

> "Until all the air
> Is one melody—
> All breath takes music on;
> And echoes upbear
> The full voiced glee,
> Till fainter, more faint, its flood is gone."

With the editor's consent, I will suggest that the mocking-bird bears confinement as contently (?) as a canary, needs (alone) a large cage, easily kept, if cleanly kept, and if a singer, is an early riser, good naturedly "snatchy" "all the day long" (when not moulting), and rings his own curfew, retiring, if out of the moonlight, "ayant the twal." However, under these conditions, the bird will not come up to the standard pictured by Mr. Wilde, above cited, and who, aside from the ornithological description, embraces much interesting history in those seven couplets, covering at least, in a fragmentary manner, seven centuries (by suggestion only) of English literature. "Dig it out." To do so will doubtless be more profitable, but not near so entertaining as to "Listen to the Mocking-Bird."

Richmond, Ky.

The List of New Hampshire Birds, by Mr. Glover M. Allen, to appear shortly from the Nature Study Press, is by far the most valnable contribution yet made to the ornithological literature of the State. As a fitting introduction, Belknap's list of 1792 is reproduced, and followed by a full discussion of faunal areas, climatology and avifaunal distribution. The List itself gives evidence of great care and thoroughness, and is very fully annotated.

Chinese Birds.

As more than 700 kinds of birds are known in China, all that can be attempted in a short article is to mention a few of them.

Perhaps most widely famed are the splendid gold and silver pheasants, and the Reeves pheasant with its long tail feathers sometimes measuring as much as seven feet. Many other less well-known varieties, however, dispute the palm for good looks; for instance, the snow pheasant with a body white as its name, set off by a jet black tail; the Amherst pheasant which has all its brilliant green feathers neatly bordered in black, and the scarlet necked white Pallas pheasant, called "ho-ki" or "fire hen."

The Chinese are extravagantly fond of birds and carry their caged favorites out to walk with them as commonly as we take our dogs. As pets, the lark and the thrush are rivals. The former is a sweet, untiring singer, the latter has greater aptitude for learning tricks, although the "spectacle thrush," with its black-circled eyes, looks so grave and wise that one feels surprised to see it perform all sorts of antics. One of its cousins, no less clever, and far prettier, has eyes only partially framed by a sombre velvet line and is known as "hwa-mi" or "painted eyebrows." Also popular as a household bird, more particularly in the southern provinces, is the magpie or "joyous one."

The most widely dispersed bird is the crow. In Pekin these are especially numerous, and toward evening one sometimes sees in midair thousands of young birds diverting themselves. That is a pretty picture, yet crows are—barring falcons—the most ill-behaved of all the feathered denizens of Pekin. They steal one another's nests, dance and fight in the gutters, jab at any one who interferes with them, and behave generally with a levity and indiscretion belying their solemn appearance. As to the falcons, of which great numbers live in the gate towers of the old city wall, they make raids upon the markets and street stalls, snatching at whatever they fancy, and, if foiled in an attempt, giving vent to ear-splitting screams. Their sins are forgiven, however, on account of their constituting the city's entire and only street cleaning department. Crows, too, are respected, as examples of the virtue most highly honored by Chinese, i. e., filial piety—as the young are said to feed their parents when disabled.

Other prominent aerial residents of China's capital are the swallows—so numerous as to have given their name to that part of the

country which is often called "Yen Kwoh" or "The Land of Swallows." Then not to be forgotten are the pigeons, circling about as they do in large flocks from whence floats sweet æolian music, due, it must be explained, to ingenious little harps tied on the backs of some of the birds. These involuntary musicians take the position of social leaders, and are followed by crowds of admirers. Pigeons' eggs are much used in cookery, and the natives believe that if freely eaten they render a person immune from smallpox.

The entire coast of China is alive with gulls, terns, grebes, and curlews, the latter being wonderfully tame and friendly. On the southern coast, herons, egrets and pelicans abound. Swans, geese and ducks resort to inland waters. The duck, of which ten species exist, is almost as ubiquitous as the crow, and on the banks of the rivers are many "duck villages," where the eggs of the domestic varieties are artificially hatched in enormous quantities, and the ducklings are fed and cared for during the first five or six weeks of their lives. Finally they are sold wholesale to "duck boat" men, who peddle them to the country people and in the towns. These men row with a huge oar fastened at the end of the boat or sail but a short distance each day, and every morning the ducks are let loose on shore to forage for themselves. At dusk a boatman will pull out a couple of planks and utter a peculiar cry. This call must be explained by old birds to newcomers for the entire quacking cargo hurries on board to be lodged for the night in two great pens, which project on either side of the boat.

Another bird to be met with on the rivers is about the same size as a duck, but far more accomplished, being none other than the fishing cormorant. Short-necked, with a long, slightly-hooked beak, it is not at any time a beauty, but with feathers ruffled by a day's work it looks particularly ugly. At sunset, long lines of the fishing boats may be seen going home, each having on board a dozen or more birds perched in nearly equal numbers on the sides, and it is said that the cormorants' own instinct impels them thus to balance the craft. When numbers of these fishers are in the water together the scene is most lively and interesting. Each boatman sends five or six birds at a time to dive, all of which have an iron ring slipped around the neck, just loose enough to permit free breathing, but not the swallowing of fish. Until a bird's education is finished, this ring is attached to a chord which is pulled when the pupil misbehaves by quarreling, remaining too long under water, or wandering idly about. All graduates know their own master and without delay take their catches to his boat. A full

grown cormorant can bring up a fish weighing as much as itself; if a fish is too heavy another bird will often assist in carrying it aboard, although young or weak fishers are robbed of their prizes by stronger companions.

The peacock, although not indigenous to China, is reared in all the provinces, and its tail feathers, stuck in mandarins' hats, denote certain grades of official rank. The characters in which the name is written mean an immense or magnificent bird.

Owls are wide spread, also vultures and eagles. Among the commonest small birds are tits and reedlings; robins, tailor birds, and woodpeckers exist, but are rare. Several kinds of kingfishers are known, and the glittering metallic blue feathers of one variety are used to make fans, decorate wedding chairs, etc.

Grouse, quail, partridges and snipe are almost inconceivably numerous in all parts of the empire. Poultry is reared in quantities, and there are many different breeds.

In concluding this brief account of some Chinese birds, mention may fitly be made of one dubbed by natives "The Emperor of all Winged Things." It did not head the list for the reason that this bird—the phœnix—exists only in literature and in art. The Chinese, however, believe it to have been extant in the days of Confucius. As pictured, it bears some resemblance to the golden pheasant, and has feathers of five colors in vivid shades. Constantly appearing on porcelains, it is in even greater favor as a subject for embroideries. Writers describe it as having been so gentle that it avoided crushing tender plants and refused to feed on living insects.—*Our Animal Friends.*

The Origin of the Rattlesnake.

The Passamaquoddy Indians—like all other Indians—have many legends attached to their tribe. Around one of their prophets, called Kuloskap, has been built a great epic, very much resembling our Bible history. He seemed to be the patron saint of these warlike people, and he performed miracles quite beyond the power of mortals. Some of the Passamaquoddy warriors were very arrogant, and though Kuloskap gave them warning of a great flood, they said they did not care.

"The water may rise above our heads," said Kuloskap.

They only laughed and replied: "We shall then be very wet."

"You had better be good and quiet, and pray that you may es-

cape from drowning," warned the prophet. But they only mocked him, and whooped, and got out all of their rattles, which were made of turtle shells filled with little pebbles, and danced to the flood, rattling all the way.

Then the rain began to fall, and the thunder roared, and the lightning flashed, and the water rose higher and higher. But still they kept on dancing and shaking their rattles. Then Kuloskap became angry, and to punish them for their arrogance, he turned them into rattlesnakes, to crawl about the rocks. To this day when the rattlesnakes see a man, they lift their heads and hiss, moving them up and down. This was called their dance, for they shake their rattles just as the warriors did, when they danced to the flood.—*Los Angeles, Cal., Times.*

The Story of the Dinichthys.

Those who desire to know the full story of the great fossil fish, Dinichthys, will read the Report of the Geological Survey of Ohio, Vol. I, Part II, Paleontology. It is, of course, technical, and therefore ill adapted to NATURE STUDY, but the following extract from the account by Professor Newberry, which may be found on page 320 of that work, will perhaps add to the interest in the more popular story given below:

"Our first knowledge of *Dinicthys hertzeri* we owe to the industry and acuteness of observation of Rev. H. Hertzer, a clergyman stationed for two years at Delaware, Ohio; and who, while performing his ministerial duties, and receiving a very small salary, still found time to make many important collections and observations in geology. The town of Delaware is located upon the line of junction of the Huron shale and the Hamilton and Corniferous limestones. The Corniferous abounds in fossils, and Mr. Hertzer collected a splendid suite of the icthyolites which characterize this formation; but the Huron shale had, up to this time, been regarded by all geologists as barren ground—nothing but a few *Lingulæ* and *Discinæ* having been obtained from it. Near its base the Black shale contains, both at Delaware and elsewhere, a great number of concretions composed af impure limestone. These are often quite spherical, and ten feet or more in diameter. In examining some of

these septaria which had been split, apparently by the frost, Mr. Hertzer discovered that they not unfrequently contained masses of silicified wood (*Dodoxylon newberryi* Dawson) or fragments of bones that had served as nuclei around which they had formed. Of these bones several were taken by Mr. Hertzer to the meeting of the American Association at Buffalo, in 1866. There they were submitted to me, and I recognized them as the bones of huge Ganoid fishes, altogether new to science."

The story of the scientific work accomplished by this persistent clergyman has been prettily retold by Katherine D. Sharpe, in the *American Inventor* for May 15, 1903, and will be of interest to young and old alike:

"The pastor of the little German-Methodist church went singing cheerily to himself along Winter street and off into the country, one bright summer morning. He was at peace with all the world, not even greatly regarding the inquisitive glances and solemn head-shakings of certain common-sense business men who stood at their doors as he passed, and remarked one to another:

"'Off to the hills again with his hammer! Poor fellow! He'll find there's no money there.'

"But the hills of Delaware County, Ohio, gave up their treasure at last to the seeking of Rev. Henry Hertzer; and to his patient labors and sagacity is due the discovery of one of the most remarkable of the great fossil fishes found in Ohio.

"In the study of animal development, through geology, more than one "missing link" has, at various times, excited the interest and research of the student. The science is still so immature, and discoveries are so constantly being made that the unbiased mind holds itself in readiness for new revelations.

"In the line of relationship between the batrachians and fishes, the Lepidosiren, or mud-fish, discovered in 1837 by Dr. Matterer, in the Amazon River, has held a controverted position; some systematists ranking it as the highest of

fishes, while others class it with the reptiles. This curious animal is the only living representative of what, at one time, was a large and powerful class of creatures.

"Mr. Hertzer, breaking into fragments the huge septaria of the Huron shale, so abundant in Delaware County—though one of the toughest and most intractable of the stony formations—was rewarded by finding the fossil bones of some creature to him then unknown.

"Several of these bones were taken by him to the meeting of the American Scientific Association at Buffalo in 1866. There they were submitted to Professor Newberry, who recognized them as belonging to huge Ganoid fishes, altogether unknown to science.

"Mr. Hertzer, with renewed interest in his investigations, returned home, and continued his search among the concretions.

"With most patient care and skill, the hundreds of fragments which he found in the nuclei of these huge spheroids were cemented each in its proper place. In one septarium a head of Dinichthys, though somewhat dislocated, was complete in all its parts. In another was a perfect mandible, while still another contained one of the teeth of the upper jaw.

"Though much broken, these specimens were carefully fitted to each other and restored to full integrity by this faithful student.

"'The bones contained in these concretions,' says Prof. Newberry, 'are those of gigantic fishes, larger, more powerful, and more singular in their organization than any of those immortalized by Hugh Miller. I have named the most remarkable one Dinichthys Hertzeri, or Hertzer's terrible fish. This name will not seem ill-chosen when I say that the fish that now bears it had a head three feet long by two feet broad and that his under jaws were more than two feet in length and five inches deep. They are

composed of dense bony tissue, and are turned up anteriorly like sled runners, the extremities of both jaws meeting to form one great triangular tooth which interlocked with two in the upper jaw, seven inches in length and more than three inches wide. It is apparent from the structure of these jaws that they could easily embrace in their grasp the body of a man—perhaps of a horse—and as they were, doubtless, moved by muscles of corresponding power, they could crush such a body as we would crush an egg-shell.

"'Perhaps the bony shields worn by Dinichthys were for the protection of the wearers against the powerful jaws of their own kin. But it is very improbable that the species was, to any degree, self-devouring; for the double reason that cannibalism is an offence against a far-reaching law of nature, and the carcasses of even the younger individuals of Dinichthys must have been very hard to crack, even for the all-embracing and massive jaws of their parents and adult relatives.'

"At least one hundred specimens have been found in the rocks of the Devonian time, which shows that the Dinichthys greatly exceeds in numbers any other of its contemporary relations. To Ohio belongs the honor of first giving to the world its discovery. This creature was eminently carnivorous, and from the extraordinary development of its dental apparatus, it must have fed upon large and resistive animals.

"Prof. Newberry secured for Columbia College, School of Mines, the fine specimen discovered by Mr. Hertzer, where it occupies a place of unique and distinctive interest."

What is the little tribe of Birds, or that of Quadrupeds, compared with them? All the animal species, all the various forms of life, brought face to face with this one family, disappear and are as nothing. Put the world on one side, and on the other the Insect World; the latter has the advantage.—*Michelet.*

Nature Study Lessons. XIII.

BY EDWARD J. BURNHAM.

When some time has been spent in catching insects of as many kinds as possible, in the garden, by the roadside, in the fields, and in the brook, an hour should be given to examining, separating, and arranging them in groups. It is well worth while. As stated in the last lesson, the children enjoy classification, at least as play, while for older people, in these days of practical entomology, there is a sense of satisfaction in an acquaintance with at least the major groups of insects. Besides, one may forget many things one does not wish to remember, while listening to the eager disputation of the children.

When the collection has been carefully examined, and the eight-legged and many-legged creatures have been placed by themselves, it will be found that only six-legged creatures remain. These are the true insects.

Among these insects, in any day's collecting, there will almost surely be some with hard, horny wing-covers, which meet in a straight line down the back. They will often be as unlike as can be in other ways, but if they have these wing-covers meeting, and not lapping, in a straight line, they belong in the same pile, for they are all beetles.

Among them may be the shiny, black Ground Beetle, that was found in the grass or under a board or stone; there may be Rose-bugs from the rose bushes, and Golden Tortoise-shells from the morning glory vines. There will quite likely be some Lady-bugs, that are not bugs at all, of course, because they have wing-covers, like other beetles. In the Eastern States, at any rate, one may often, in July and August, find the Dogbane Jewel, a beautiful beetle, on the dogbane beside the road. In clumps of elders by the brook, there may be some Cloaked Knotty-

horns, beetles worth going far to see ; while in the brook itself are the Whirligigs, hard to catch, with their eyes looking above and below, and seeming exactly like two pairs of eyes. There are several other kinds of beetles in the water, and many, many other kinds upon the land, but we can tell them all by their wing-covers, that meet in a straight line along the back.

Sometime, when we have learned to tell the other insects apart, we will come back and study the beetles some more.

In a collection made on any summer's day, there are sure to be many insects that agree in having a sharp, jointed, hollow beak. This can be pushed, by some of these insects, into the stems and leaves of trees and plants, from which the juices are sucked ; by others, this sharp beak is thrust into living creatures, which the insects seize as their victims, or live upon as parasites. When not in use, this sharp beak lies under the head and body, reaching back between the front pair of legs.

Some of these insects have the front wings hard and leathery next the body, but thin and veined in the outer half. They sometimes look a little like wing-covers, but they lap across each other, instead of meeting in a straight line, as in beetles.

These are the true bugs, and the Squash-bug, the Stink-bug found on berries, the Water-striders and the Water-boatmen are good examples. There are other insects with jointed beaks, like the noisy Cicada or Dog-day Harvest-fly, whose wings rest at the side of the body and are not leathery, but as they have beaks, and live by sucking up juices, we must put them all in the same pile.

Now we can always tell the beetles from the bugs, which is more than most grown people can do. Next time, we will learn to know some other kinds of insects and put them in their proper piles.

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THE NEST THAT FAILED.

PHOTO BY W. H HUSE

NATURE STUDY.

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The Nest That Failed.

BY EDWARD J. BURNHAM.

There is a wood so near a city that one may hear the steam whistles and the striking of the big clocks, and yet far enough away so that the din of the turmoil is softened. Paths wind through the dense growth beneath the trees, and cross one another irregularly. It would be a delightful solitude, if such a number of solitude-seekers did not destroy what they pursue, as sometimes happens in the pursuit of other things.

Directly overhead, across one of the paths, two red-eyed vireos built their nest. We found it by first observing the male, flitting about among the bushes. Soon, as we approached, the female flew from the nest, setting in motion the bough from which it hung. Then we wondered that we had not seen it before, and that others had not seen it also.

It was a dainty nest, of strips of inner bark from dead trees, root fibers and a long piece of twine, all skilfully in-

terwoven. It contained four eggs, one much larger than the others, as shown in the picture, and we knew by this larger egg that the vireos were being imposed upon. For it was a cow-bird's egg, laid there by a bird too unskilful or too lazy to build a nest for herself, and too shiftless to care for her young.

After the nest had been photographed, we took the egg away, for, if it remained, there would in time have been a young cow-bird hatched, which would clamor so loudly and persistently that the vireos would be kept hard at work feeding it, to the neglect of their own little ones. Worse still, as the greedy thing grew larger and stronger, it would crowd the young vireos out of the nest, to die on the ground beneath. Then, when it was grown up, it would not stay with the vireos or any other respectable birds, but would go in the company of other cow-birds that had been hatched and reared in the same way.

The scientists have named it Molothrus Ater, the black vagabond or greedy fellow, and it deserves its name. It does no work that it can shirk. It even follows the cows in the pasture, to eat the insects that the cows drive up in feeding, rather than to hunt for insects on its own account, as other birds do. These vagabond birds go in flocks, all mixed up together, and do not choose mates, and build nests, and feed their young. The females lay their eggs, one in a place, in other birds' nests, and they choose nests of birds smaller than themselves, that their young may have the better chance. No other bird in all America will associate with them, except the English sparrow, and that is a foreigner, who perhaps does not know what disreputable vagabonds these cow-birds are.

We hoped we had done the vireos a good turn when we had taken the cow-bird's egg away, but it made no difference in the end; for when we went a week later, to see if

the little vireos were hatched, we found that another kind of vagabond, who evidently did not own even a pocket-knife, had torn the limb from the tree, in order to steal the nest and eggs. The vireos had gone away, and perhaps, when they fly southward this fall, they will feel that their summer's work has been lost, and that it would have been just as well if they had not tried at all. That is the way people are apt to feel when things go wrong with them.

From a bird's view-point, that pretty nest, built in the much-frequented wood, invaded by a vile cow-bird, and plundered by some brute of a man or boy, was a sad failure; but we know that it was a grand success in a way which the disappointed vireos could not possibly understand. For the picture of the house they built will go in NATURE STUDY all over their own country, and to Europe, and even to the far-away Philippines; and it will be bound in books, to stand on the shelves of many public libraries, where, years from now, boys and girls will still sometimes read the story of the nest that failed.

The Trade in Bulbs.

The man with the little garden walks round the public park and sees crocuses and daffodils, hyacinths and tulips by the thousand. He understands they are imported direct from Holland by very large users of the bulbs. It is an astounding trade as so measured and taken as an example of what others do in the same line, as tradesmen say. The Japanese trade comes next in importance to the Dutch. During last season eighty tons of lily roots were sold, and this amounts in numbers to about 3,000,000. But this is nothing to the Dutch trade, if we take the same basis of weight and numbers as the Japanese instance. The average sale is sixty tons per week, which is in numbers about 2,500,000, The season lasts about four months—sixteen weeks—so that in weight 960 tons are sold; and this amounts in numbers to the almost incredible sum of 40,000,000.—*Saturday Review.*

Snooks.

BY E. ALFREDA HALL.

Snooks was a cat. He had no particular reason for his name, which could not be said of his brother, Flypaper, who was christened thus after an unfortunate sitting down in early life. Both cats were favorite pets of their master, who humored them in every way and was continually giving then some delicacy, not the least delicious of which was red squirrel meat. This was often obtained, for squirrels were common in the north country and were a nuisance.

Flypaper was a mighty hunter and usually obtained his own meat. Moreover, he had a wholesome fear of a gun. Snooks, on the contrary, had no fear of fire-arms, neither was he very successful in hunting. He was the greater pet of the two and was oftenest at his master's side. His wants were always attended to and he early learned to make them known by voice and action. He had so many times received a squirrel after a report from the gun was heard that he soon learned to connect the two. The next step was to learn that the combination of master and gun leaving the house together meant fresh meat, and he was soon trotting along too, ready to pick up the game. One day he came into the house mewing as if something was wanted, but nothing inside would satisfy him. On going to the door to put him out, a squirrel was heard snickering in the butternut tree. The gun was taken out and the squirrel brought down while Snooks complacently trotted along and retrieved the game. From that time he frequently came in to announce a squirrel in the butternut tree.

One day his master was slow in seeing the game that was heard but a moment before, and Snooks, getting im-

patient, leaped upon his shoulder, a favorite trick when they were out on walks and he wanted a ride, and stood there until the gun was discharged and the game was on the ground. Then he leaped down and seized it.

Three Interesting Birds.

BY NORMAN O. FOERSTER.

THE PRAIRIE HORNED LARK.

The Prairie Horned Lark, a winter bird, which east of here regularly goes north before May and breeds chiefly in the region of Lake Erie, nests every year in Schenley Park, Pittsburg, Pa.

It was on March 3d that I made my first visit to the Park. A mild temperature (57 deg.) a cloudless, dark blue sky, a very gentle southerly breeze, and a transparent atmosphere combined to make the weather conditions perfect. In the open fields—which were thawed—I came upon a party of four, walking about, picking up seeds of small weeds and grasses, continually uttering a plaintive, "che-e." They were not shy, and I could approach within about four yards. One mounted a small stone and with his square-looking head thrown back gave vent to his overflowing feeling in a rippling warble. Another daintily walked over to the macadamized road and after swallowing a few fragments of stone as if to clear his throat, launched into the air. Soaring higher and higher poured forth a song evidently intended for the ears of the female who was calmly watching him—a song far more varied than the sweet but monotonous song of about seven notes usually sung. Higher and higher he dashed, climbing the dizzy steps of space until, long after his notes could not be heard by my human ears, he became a mere speck in the blue sky, and finally disappeared from my sight.

though probably not from the wonderfully sharp eyes of his companions. A moment later the bird returned from a direction entirely different from that which I expected, and as if nothing whatever had occurred, resumed his feeding on the soft ground. A few days later the two males had become the accepted mates of the two females, and the two pairs separating, began to think about nest sites. Sometime during the latter half of May the first broods left the nests.

THE OVENBIRD'S LOVE-SONG.

When the woods and fields are most beautiful; when all the early trees are in full leaf and form a substantial background for the dizzy pinks of the oaks; when dogwood is in full blossom, and the snowy white trees give a touch of life and gaity altogether wanting in the somber woods of midsummer; when the new, fresh undergrowth is set off with fiery Indian Pink and the exquisite lavender flowers of wild phlox and geranium; when the fields are covered as with thin sheets of snow with houstonia, and everywhere flourishes the composite squaw-weed;—it is at this time of the year—early May—that we go into the woods toward sunset and listen for the love-song of the Ovenbird, and keep an eye open for the inspired singer.

To our left "teacher, teacher, teacher, teacher, teacher," sounds the simple but not unpleasing crescendo. From the right come the same gushing notes—the same to exactitude. Behind us is another. From the distance like a rushing waterfall, flood the same notes. They are everywhere. The single song of a Redstart; the nasal "zee-u zee-u, ksee-ksee, ksee-ksu" of a Blue-gray Gnatcatcher relieve what might otherwise be a monotony. Suddenly a great flood of indescribable melody is poured out from the tree-tops, dashing downward suddenly, and all the while pouring forth a song not unlike the Louisiana Water-

thrush's flight song but even more varied. Can it be that demure, sedate little walker, who but a moment before with so little energy opened his bill to let forth his commonplace crescendo? It is.

CAROLINA WREN.

During the first three weeks of March I found the Carolina Wrens more prominent than at any other time. The first I ever saw was dated March 6. To quote my journal—"in grape tangle on or near ground; flew to the top, then to a tree, and perching in the extreme top, sang his wonderful song—loud, clear, mellow." Of course it was my pleasure that caused me to write thus; I did not think of writing a field description of him, or of attempting a musical notation of his song or even of giving a syllabic comparison. Later I was often puzzled by new songs, and when these so frequently turned out to be those of the Carolina Wren, I decided that he possessed an extensive repertoire. Once it was a phrase of seven notes like, "If here, what is it you want?" Again a peculiar, gutteral "beruth," on a descending scale, with the second syllable drawn out. This I first heard at an oil derrick, and the gutteral, unbird-like notes mingled strangely with the creaking of the driller, so that it was not until I discovered him perched on a low, oil-dripping crosspiece, not a foot above the ground, which

> "like a witch's oils,
> Burnt green, and blue, and white;"

it was not until I *saw* him here, half-ventriloquosly uttering those notes, that I could believe a bird was indeed the source of it. But these notes are heard rather infrequently as compared with his cordial-like "tea-kettle, tea-kettle, tea-kettle" and "who are you, who are you, who are you."

A Word About Collecting.

BY SUSY C. FOGG.

The school year is closed, and the boys and girls will be allowed, it is hoped, to pass their vacation in the free open air, unhampered by any save the few imperative restrictions.

A glance at the school curriculum of to-day shows that many subjects have been introduced that formerly were unnoticed. Among these, of course, is Nature Study, and it is a cause of growing satisfaction that in so many cases the school instruction is being supplemented in the home, a starting-point for all good reforms.

And now, suppose the child "collects!" Would it not be well for the person interested, during the summer vacation, to note whether he snips the blossoms only to carry them about until they wither in his hand; whether the collection of butterflies is made only for the pleasure of having something pretty to look at and to see how many and rare kinds may be gathered in—one of the delights of postage stamp collections; just *why* he has the egging instinct etc.

If the collection is a means to an intelligent end of comparison and study, it is certainly to be recommended; if only a passing fad and more or less a case of wanton destruction, it would seem wise to discourage it.

Some practical individual will say—"Well, if my children did not pick these flowers, others would," or, "These butterflies are very short-lived," and, "If these eggs were not taken, the cats would eat the young birds."

These unquestioned facts do ease the conscience wonderfully, and there is an abundance of these things, but is not this the wonder of it all?

Why not guard it while it exists in luxuriant measure and why destroy needlessly where we cannot upbuild?

The satisfaction may have sometime been ours, in younger days, of having made a clean job of it, but we have come to see that a few of the buttercups that sway above the grasses will do quite as well. If all are taken, the next passer-by does not miss the color because he does not know it existed there, but there is no glad surprise, half the grace is gone and the spot is wanting in some of the variety which was indigenous.

By the Wayside.

BY MARY-LEE VAN HOOK.

One of our naturalists has said that women and children make poor observers; that they are seldom accurate, are willing to leave a question unsolved or to jump at an unwarrantable conclusion. He was right, no doubt, but their joy in nature is true, though their science be at fault. All nature lovers need not be nature students, though they usually want to be; it is quite possible to enjoy the song of a bird or perfume of a flower without knowing the name of either.

Children always find the interesting plants, I think. They know and taste the pungent toothwort, pepper grass and shepherd's purse; while the sassafras leaves and the slippery elm have an unending charm. For my part, I am like the children and am never satisfied until I have nibbled a new plant as a part of the examination; a proceeding perhaps not well to recommend to all.

The yarrow has an odd taste. It is rather a pretty plant, too, with its fern-like leaves and white blossoms, and so common that every-one knows it. On a botanical trip to the West we found the yarrow to be one of the most wide spread of the plants. It seemed to grow under every condition and in every kind of soil; on the plains, in the

woods, in dry or damp ground, it was equally at home; and when we climbed a mountain there was the yarrow at all altitudes, even at the top. To be sure, there, it was checked in its pride and diminished in size, as are all alpine flowers; for the severe conditions at a high altitude demand as small a surface expansion in the plant as possible and Nature responds by reducing the stems of the plants.

The equisetum or horse-tail rush is a plant the children love. They gather the long reed-like stems and pull them to pieces at the joints. It is a flowerless plant, which produces in summer a cone-like spike made up of scales, shield shaped, which bear on their under surfaces cases containing the spores. Examined under the microscope, each one of these spores is found to have curled about it four slender threads, which, when the spore is damp, cling closely around it, but when dry, spring back and so dislodge the spore.

A short time ago, on a walk, the leaves sprouting from an old oak stump caught my attention, on account of their bright color. I picked a small branch and noticed a cluster of perfect little apples growing to the leaves. They were silvery white in color with a blush of red on each one. I knew them to be oak-galls, abnormal growths made from the sting of an insect. Many plants are so stung by different insects, but in the case of the oak, it is usually the small wasp, Cynips. The eggs of the insect are deposited at the same time that the sting is made, and the surrounding tissue of the leaf or stem is stimulated into a new growth. Perfect protection is thus afforded the young larva which matures inside of the gall.

Galls vary in size and structure. Some of them are many celled and so accomodate many larvæ. They contain a large proportion of tannic acid and are used in the preparation of leather, and also in the making of inks and

dyes. The ancients seemed to have employed galls for these uses also, and Pliny tells of their additional value as medicines. But he evidently had little idea of their origin, referring to them as the second fruit of the oak besides acorns. It is thought Josephus may have alluded to galls when he mentioned mad apples or apples of Sodom, fruit fair to the outward view but, when plucked, turning to dust and ashes.

Chicago, July 13, 1903.

Weather Wisdom.

BY WILLIAM H. HUSE.

"When one can talk of nothing else he talks about the weather," is a remark that must have started with some heartless cynic. It is often true, however, whether applied to the ordinary conversationalist or him who would win fame by predicting the weather for months in advance.

The foundation for such far reaching prophecies is usually the positions and phases of the moon and planets, as if those celestial bodies did not have troubles enough of their own without being held responsible for terrestrial weather. Much is always made of the so-called changes of the moon, as if the moon changed any more at one time than at another. The influence of the planets, millions of miles away, is still more difficult to understand; and most difficult for the uninitiated is the fact that a certain phase of the moon will produce fair weather in one section and a storm in another.

Our country covers considerable territory, to say nothing of the rest of the world, and there is usually quite an assortment of weather on hand at any one time. Consequently the weather prophet is usually safe. If his predictions for a given period are fulfilled in any locality he

is sure to announce in the most public way, "I told you so." If no section gets his weather, he says nothing and everybody else forgets what he predicted.

The latest claimant for prophetic honors is a Mr. Wightman who kindly announced at the beginning of the year what weather we might expect for the following twelve months. His predictions were somewhat general, reminding one of the standard almanacs that usually spread out over the greater part of a winter month the announcement that "About this time we may expect a storm." Such prophecies are usually prosy. Mr. Wightman is poetic. Witness the opening of the following quotation from his prediction for the period from the middle of May till the end of June :

Pattering raindrops will threaten a storm, as black masses of hurrying clouds go chasing each other across the sky. Increasing warmth will ripen the blossoms into laughing fruit, and clear, lambent sunshine will bring to all created beings a sense of new creation, in the glad, new life of spring. Minor storms 20th and 21st; as these days begin to dawn, if the sun appears above a broad circle of dark cloud it will foretell one of those burning spells which sometimes precede the heat of summer. Rich, balmy air, with increasing warmth, will follow, up to new moon on 26th, when the last regular storm period, 26th to 29th, will bring darkening skies and threatening thunderstorms.

June.

The magnetic and electrical conditions prevailing last days of May will continue through the greater part of this month, and assure an abundance of rain. Minor storms, 1st and 2d, will be excited by Venus; central on 3d. Through the month hot, sticky weather will predominate, the atmosphere surcharged with moisture and hanging close to the earth, and so muggy "a man must do his work twice to get it done." There will be extreme heat, turning suddenly to unseasonable cold. The first regular storm period, 6th to 9th, will witness large masses of clouds rolling over the face of the sky, distant lightning portending storms, and as they appear and increase, the flashes will succeed one another more rapidly, the thunder growl more loudly, and the wind howl, as the precur-

sor of a severe storm. For several days, up to and past minor storm days, 12th and 13th, it will be showery, with frequent hail and thunder, resulting in some locailities in violent tornadic storms. The second regular storm period, 18th to 21st, will feel the full force of earth's summer solstice on 21st and cause an abnormal amount of thunder, lightning, heavy rains and hail, especially in the evenings and at night. Minor storms, 24th and 25th. The last day of the month is the center of a Vulcan storm period, which will run into July.

It will be observed that about ordinary weather is predicted. That shows the wisdom of Mr. Wightman. It is far the safest. There was an abundance of rain.

"I told you so."

There was no mention, however, of the unprecedented drought in New England during May, nor of the floods, the worst for more than a generation, in the Mississippi valley; and the unusual rainfall in the East in later June would hardly be inferred from the printed prophecy.

There is no law against long-distance weather predictions, and there probably never will be. It is a harmless diversion and is interesting to some. Moreover, it is pleasant to be assured when the wintry winds do blow that in early October the weather will be "a little cool, but with a tang in the air that will soothe like a balm but be a spur to energy and heartiness in its crispness"—the wholesome touch of fall.

Nature's Pyrotechnics.

BY CHARLES H. OAKES.

Hot was the air in a windless swoon,
And night crept on apace;
I marked the clouds, and stars, and moon,
Gild Nature's veiling face.

Throughout a bank of clouds, low cast,
The lightning played so rare,
I fancied that the gods, at last,
Held Fourth of July there.

A Queer House.

BY SUSY C. FOGG.

A walk in the unmown fields in early summer is rendered somewhat unpleasant by the frequent masses of a frothy substance which adhere to blades of grass and other vegetation, but are easily brushed off onto shoes and clothing.

One person asks: —"Is it the work of frogs or tree-toads?" another, "Is it caused by snakes?" and a third surmises that they may be eggs of some insect.

By opening one of these masses a small greenish insect is revealed, only a few millimetres in length, with an abnormal frontal development of the head and a strong beak attached. His whole makeup bears the general "air" of the Hemiptera, order of "true bugs," and belongs to the family Cercopidae, a name from the Greek Cercops who belonged to a race of fabled men. Why the connection?

I tried recently the experiment of removing entirely from their moist location three of these insects, and found them well able to run about, having well developed legs and tarsal claws. After a period of seventeen hours, I placed them again on fresh blades of grass. They appeared active, at once inserted the rostrum into the grass stalk, and simultaneously with this pumping process, gently raised the tip of the abdomen and with a swaying movement from side to side threw off bubbles of the sap as soap bubbles are thrown from a pipe. In half an hour the mass of foam was equal in size to that of the insect; in one hour the envelope was again complete.

This covering under a lens looks like a house of glass globules and has great brilliancy. No one of us knows, I suppose, how great a luxury life may be to the creature within it and if the material of its construction is not

pleasing to us, perchance, we should say with J. C. Van Dyke—"The fault is not in the subject. It is not vulgar or ugly. The trouble is that we perhaps have not the proper angle of vision. If we understood all, we should admire all."

It is supposed that under this protective covering of froth the insect undergoes its various changes during the period of growth. A few hours after the insects had hidden themselves from my view, the froth seemed to partially dry and shrink away from one of them, and he was caught in the act of slipping off the old, useless coat for a new one with pale brown, overlapping wings large enough to clothe his body.

Lo, and behold! here was one of the little frog-hoppers. His life history seemed to be in no wise connected with frogs, but the contour of head, flat, toad-like shape and spry leaps might offer the suggestion of the name.

The Albino Robin.

In the summer of 1900 some friends of mine came to me with a story of a strange white bird that had been seen several times among the trees of a small grove in southern Ohio, the state in which my home county is, writes Henry Holcomb Bennett, in *St. Nicholas*. Finally another friend told me that he had seen a pair of robins feeding it, and, between us, we agreed that it must be a white robin—an albino.

An albino among men is a person whose skin and hair are unnaturally white. Among birds and animals an albino is one which is white, differing from others of its species, A bird or animal the normal color of which is white, or which changes to white feathers or fur for winter, is not an albino. The perfect albino has pink eyes, and no color about it. The white robin I saw was a perfect albino.

The rest of the brood, of which the albino was one, had scattered and were looking out for themselves; but the parent birds were still feeding their white fledgling. The other birds in the grove

took a great deal of interest in the strange inhabitant, especially the purple grackles. As the white robin sat on a bough the grackles would perch near it, looking at it with their heads turned shrewdly to one side, or hopping from place to place, as though to get a better view. All the time they kept up a blackbird conversation about the object of their curiosity, clucking and chuckling away at a great rate.

The white robin did not hunt food for itself, although it was fully old enough to do so, but depended on its parents. When it flew, it did so awkwardly and blunderingly, and generally seemed to prefer staying in one place.

A day or two afterward two boys brought to my office the white robin, dead. One of the local papers had said that an albino robin might be sold to a museum, and I accused the boys of having killed the bird on the chance of selling it. This they stoutly denied, saying that they found it dead. I took off the skin for the purpose of mounting it, and found that the boys had been telling the truth, for there was no sign of an injury. The poor robin was very thin, and its stomach was almost empty, excepting for the remains of one bug. I wondered if its parents had grown tired of feeding it. I found, also, that the reason it flew so poorly was because its eyes were defective, and that it must have been almost blind. Had its parents fed it until the time of the fall migration southward, the white robin could not have gone with the rest, and must have starved. The robin was entirely white, with pink eyes, a pinky-white beak and pinkish legs.

Albinism, by the way, is caused by the lack of pigment, or coloring matter, in the quills. Birds so afflicted are, usually, not well developed, and suffer from attacks of individuals of their own species.

The Robin as a Flycatcher.

On June 26 one of the editors of NATURE STUDY observed a robin fly from its perch on a small tree, seize an insect that was passing, swallow it and then return to its perch, all as easily and naturally as the most accomplished flycatcher could do. This may be a frequent thing, but it was new to the observer, and so is here recorded.

Fate of the Passenger Pigeon.

To him who knows the story of the passenger pigeon, says a writer in the *New York Post*, this group of beautiful, grayish brown birds with the irridescent golden sheen upon their throats is the last word of a tragedy of animal life. America was once the land of the wild pigeon. Early American writers are full of references to it. Alexander Wilson, the father of American ornithology, estimated that a flock seen by him in 1808 contained over 2,000,000 individuals. It stretched from the horizon to the horizon, as far as the eye could see, and was over four hours in passing a given point. He saw a nesting colony 40 miles long and several miles in width.

In 1805 Audubon saw schooners at the wharfs in New York loaded not in packages, but in bulk, with wild pigeons caught up the Hudson river and sold for a cent apiece. Up to 1860 the bird continued fairly abundant. Then a frightful slaughter began, to supply an increased food demand. Gun, pole, club, net and sulphur pot were employed. Thirty dozen birds were captured at one spring of the net. One man netted 500 dozen in one day. In the nesting season trees were shaken or felled and wagon loads of squabs taken nightly, droves of hogs being turned in to utilize what the "hunters" had left. Wherever the distracted flocks appeared the slaughter began. At the last known large pigeon "nesting," in 1878, a billion birds were killed during the season. Like the bison, it was practically exterminated, showing the terrible efficiency of man when he sets out systematically in pursuit of a lower species.

The "century plant" was so named because of the popular notion that it blooms only once in 100 years, but it need hardly be said that this idea is erroneous. In the genial climate of California, says a writer in the *Scientific American*, the plant blooms in from fifteen to twenty years, but in colder climates from forty to fifty years may be necessary in order to bring it to maturity. This plant is a native of northern Mexico, and there furnishes the pulque which is the national drink of that country. When it begins to bloom a single stalk is thrown up, from which tassel-like flowers sprout forth on either side. The great flower stalk draws all the sap and vigor from the broad leaves of the plant, which, after it has reached its perfection, droops and dies. But at the base of the fleshy leaves are found little suckers, each with a root, which, when planted, at once begin to grow.

Nature Study Lessons. XIV.

BY EDWARD J. BURNHAM.

If, in their collecting, the children have had some sort of net, there will almost surely be some butterflies among the insects taken. If, too, the boys and girls were quick with their nets, there will certainly be some skippers in the pile, and very likely some moths. For, while moths fly most by night, there nearly always are some kinds in the grass and among the bushes which may be caught in the daytime.

While the butterflies, skippers and moths are quite unlike in some ways, and differ greatly among themselves, they have some things in common, and may all be placed in one pile. For, although they differ much, they are all less like other insects than they are like one another, and so belong to the same group, or order, as it is called—as the beetles belong to one order, and the bugs to another.

The beetles are called Coleoptera, or "sheath-wings," because they have wing-covers, or sheaths, for their wings, and the bugs are called Hemiptera, or "half-wings," because many of them have wings that are thick and leathery in one part and thin and veined in another. In the same way, the butterflies, skippers and moths are called Lepidoptera, or "scale-wings," because their wings are covered with scales. These scales, however, cannot be seen without a microscope, and look like fine dust when rubbed in the fingers.

The butterflies, skippers and moths have a tongue unlike other insects. It is long, slender and hollow, is used in pumping nectar from flowers, and is rolled into a little coil under the head when not wanted. In a dead insect which has not yet become dry and hard, this tongue can

be unrolled by putting a pin in the center of the coil and pulling gently.

Butterflies, when not flying, hold their wings straight up over their backs, or nearly so, and they have thread-like antennæ, or feelers, with knobs at the tips. Most skippers, when resting, hold their front wings up straight and their hind wings flat; but this is not always true, as some people used to think it was. They have slender antennæ, like the butterflies, but, in place of knobs, the tips are pointed and curve back towards the head. Some moths hold their wings flat when not flying, and some place them over the body like the roof of a house. They have many kinds of antennæ, but none with knobs or that curve backward at the tip.

So, when making the Lepidoptera pile, it will be interesting and easy to make it in three parts, with the butterflies in one, the skippers in another, and the moths in a third. There is a great deal more to be learned about them, but we must hurry if we are to get our insects sorted into seven piles before cold weather comes. After a pile has been made, the insects in it should all be pinned—at least one or two of each kind—and placed in a box by themselves. Then, next winter, we will study them some more, and find how each group, or order, can be divided into smaller groups, or families.

In every lot of insects collected there will surely be some flies, and often many kinds; for besides the familiar black house-fly, there are green flies and blue flies, and flies that look like bees, and others that look like wasps. There are tiny flies, so small one can scarcely see them, and big ones, like the robber-flies, and some with slender, straggling legs, that one can scarcely touch without breaking them off, like the crane-flies.

All these flies, and the mosquitoes and midges, have only two wings, and are called Diptera, or "two wings."

Of course all the two winged insects should be put in a pile by themselves, and afterwards pinned with insect pins and put in a box labeled Diptera—just as the beetles are put in a box and marked Coleoptera, the bugs in another marked Hemiptera, and the butterflies, skippers and moths in one labeled Lepidoptera.

Almost any kind of a box will do for a first collection, if slices from cork stoppers are gummed at the bottom in neat rows, to stick the pins in. Cigar boxes, with rows of sliced cork, are the best of any, unless one cares to buy the regular insect boxes that entomologists use. I have often thought that children, rich or poor, find as much fun and as much profit in cigar boxes, or plain pasteboard boxes, filled with straight rows of neatly pinned insects, as in the most costly cabinets that money can buy.

When the two-winged insects, or Diptera, have been put in their proper pile, and afterwards pinned, any bright child will see at once that they can easily be sorted into smaller groups. The house-flies and meat-flies can be separated from the horse-flies, the bee-flies and crane-flies can be pinned in rows by themselves, the robber-flies and their cousins will fill another row, and so on and on.

This separating a collection of all sorts of insects into piles, or orders, and then dividiing an order into smaller groups, or families, is called classification, and I have never known a normal child that did not find keen pleasure in it, when once given a hint as to what might be done. Indeed, I have known some children, in my boyhood days, when there was no such thing thought of as nature study, to make a rude beginning on their own account, without any help at all.

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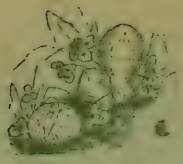

NATURE STUDY.

A monthly magazine, published under the auspices of the Manchester Institute of Arts and Sciences. EDITOR: Edward J. Burnham. ASSOCIATE EDITORS: Frederick W. Batchelder, William H. Huse, Susy C. Fogg, Theodora Richardson.

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W. K. FISHER, Editor.

J. GRINNELL, F. S. DAGGETT, Associate Editors.

This is a 24 to 32 page illustrated magazine, issued on the fifteenth of each alternate month. It is published as the officia organ of the

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and reflects the enthusiasm of this energetic bird society.

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ROCK RIMMON.

NATURE STUDY.

PUBLISHED UNDER THE AUSPICES OF THE

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Rock Rimmon.

BY EDWARD J. BURNHAM.

The New England Puritans, reading their Bibles and exploring the wilderness, were often reminded of that rock of Rimmon, in that other wilderness, to which the distressed remnant of the tribe of Benjamin fled for refuge long ago. Evidently, they fancied some analogy between the Hebrew story and their own situation, for there are several Rock Rimmons in the New England States.

Each Rock Rimmon, like many a more lofty peak or summit, has its tradition, usually of the Indian maiden who cast herself down in despair, either because of a recreant lover or by reason of the villain who persistently pursued her—traditions in which the emotions and sentiments of the civilized state are read into a life of savagery, where they in nowise belong.

The Rock Rimmon pictured in this number of NATURE STUDY is of interest today less by reason of any fanciful tradition than because it still shows the processes by which most of the hills have been rounded off and clothed with

verdure throughout the extensive area of the great Appalachian mountain system.

On its northerly side, the hill is already well rounded to a comparatively gentle slope, probably the result of glacial action in the ice age, long ago, and here trees, shrubs and coarse grasses grow well up toward the naked summit. The southerly side is a sheer precipice, about 90 feet in height and some 120 feet in length. Scattered over the plain, for several rods from the base, are rough blocks of stone, some of large size, which have fallen from the precipice above. These were loosened from the ragged edge of the great rock by the action of frost and heat and rain and snow, falling, perhaps, at the rate of one in a century, possibly of one in a thousand years.

At the base, smaller fragments have accumulated unti they form a slope at what is known as the angle of repose, reaching up one-third of the height of the precipice, and covered with shrubs and small trees. Some day, thousands of years from now, the top of the precipice and this slope will meet, and there will then be a rounded hill, covered with grass and shrubs and trees, like other hills in the neighborhood that were finished earlier.

Meanwhile, on and around the summit other processes are going forward. At the very top, the otherwise naked rock is covered with lichens, which, as they die, are washed by the rains into depressions a few feet below. Perhaps, too, they help the cold of winter and the heat of summer in the work of breaking up the rock surface into tiny fragments that are also washed down into the depressions, where enough soil is thus formed to support beds of moss. This moss, growing, dying and decaying, year after year, further increases the soil, which in time fills the depressions, after which the surplus accumulation is washed still farther down by the rains and melting snows.

At this next lower level, sedges, coarse grasses and ferns

take the place of the mosses, and a little farther down, even on the abrupt precipice, are bushes and small, struggling trees, with roots forced into the crevices of the rock.

Thus, little by little, as the years and the centuries go by, vegetation is slowly reaching upward and clothing the rugged, naked rock, whose steep side is being slowly rounded off by the irresistible forces of nature.

Not all ledges are so conspicuous and striking as this Rock Rimmon, near the city of Manchester, in New Hampshire; but wherever there is a naked ledge on a hillside, some, if not all, of these processes are going on, and it will be time well spent to take the children where they may learn to spell out the story there of world making and finishing and the rounding of the hills.

School Excursions.

BY WILLIAM H. HUSE.

There are many excursions that can be profitably taken by geography classes that can hardly be called nature study, but that is perhaps no valid reason why they may not be mentioned in this journal. There has been in the past too much dependence upon books, as if there was nothing else from which knowledge could be gained. The information we get from books is always and necessarily second hand. Much of it cannot be obtained in any other way, but this is no reason why much which can be obtained at first hand should not come in that way. There is another evil of exclusive book knowledge besides its second-hand nature. It is the tendency on the part of so many—too many—of the graduates of our schools to look with favor only upon the so-called genteel occupations and professions and with contempt upon manual labor.

It is this dependence upon books that has made teachers in a manufacturing city, for example, send their grad-

uates out from the school knowing only from books and hearsay that their city is engaged in certain lines of business. If the statement that their own or some other city has paper mills could be supplemented by a visit to such a mill, or the lesson on cotton could be succeeded by personal observation of the processes that follow the arrival of the bale at a cotton mill, knowledge would be gained that would be education and not information merely. An hour spent in personal observation is worth three with books alone.

An account of a visit by a geography class to two local establishments may perhaps show the value of such work better than argument alone. Cattle and cattle products had just been the subjects studied from the textbook. The next afternoon a tannery was visited. Only sheepskins were tanned there, but the principle was the same. The bales of sun-dried pelts were seen and followed through the soaking, the painting to loosen the wool and the pulling of the wool. The wool was rinsed and dried, and then washed and dried again. After this it was packed in huge bags and shipped to woollen factories. The skins were followed through the scraping, the various soakings, the pickling and tanning in oak, hemlock or extract. The dyed and polished leather was studied and admired and the class came away knowing more about tanning than they did before.

A neighboring establishment was next visited that was far from fragrant but fully as interesting. Here the waste products of the meat markets are brought. The suet is kept by itself, and on a long bench is trimmed by two men. The trimmed product is put into a tank and washed in ice water till all the blood and dirt are washed off. Then it is ground in a meat-cutter and washed again, coming out from this bath clean and white enough to satisfy the most fastidious. It is then melted and the fat is drained off.

This is allowed to stand in tanks till it separates into a yellow oil and a white fat. These are separated under pressure and go in different directions. The oil is known as oleo oil and is shipped to butterine factories, while the fat, now called stearine, is sent to compound lard factories and is used for shortening by bakers. The scraps are pressed after these two products are removed and the fat then obtained is sold as tallow. The pressed cakes are sold to poultry men, either whole or ground.

After following the good suet to its destination the trail of the trimmings was taken up. These are thrown into large vats along with bones and waste meat of all kinds and boiled. When thoroughly cooked the water is drawn off and the meat and bones spread out on a screen. The bones are picked out and dried on a rack of steam pipes. The best bones, those containing solid bone enough to be of some use, are cleaned thoroughly and stored in bins to be sent to factories to be made into tooth brush handles and similar articles. In the same building with the bones are the hoofs in three bins, which contain the black, white and striped specimens, each by itself. The solid colors are sent to button factories along with the horns; the striped—many of them—are sent to Japan, where they are trimmed and polished and made into fancy inkstands and other curiosities and sent back again in the baggage of travelers. The other bones are dried, ground into meal and sold to poultry men and farmers.

The meat is pressed after the bones are taken out, thoroughly dried and ground and shipped to fertilizer factories. The fat that is expressed from the meat and that solidifies on the water is made into soap in huge vats on the premises. All is disposed of now but the water that the meat is boiled in. This is full of blood and the juices of the meat. It is boiled in large boilers until it is of about the consistency of molasses and is then pumped out and

allowed to fall upon a slowly revolving sheet iron cylinder that is heated by steam. A scraper on the side removes the "beef extract" which is dry and hard, and it falls to the floor to be ground up and added to the ground meat for fertilizer.

There is a lesson in such a visit on the economy of modern industry, that is profitable to the adult as well as the child, and emphasizes one's belief that the education of school children should not be considered complete till they have seen all the various industries that are carried on in their home city.

Scared by Bird Cannibal.

A writer in the *Boston Herald* relates that a large colony of sparrows took possession of the attic and the eaves of a certain county courthouse and built their nests and reared their young there with all the bustle, noise and enthusiasm for which they are noted.

One day in the spring a butcher bird made his appearance and lighted on a tree near the courthouse. Now, a butcher bird is the remorseless cannibal of his tribe. He catches birds of all kinds and impales them on a thorn tree, sometimes having a dozen victims hanging there at one time awaiting the satisfying of his hunger.

Perhaps the sparrows had never seen one before. Indeed, it is more than likely, but instinct with the weaker birds is a sort of good angel for their protection, and one minute after the butcher bird lighted on the tree there was not a sparrow to be seen in the neighborhood, though one minute before that at least a hundred of them were flying about the house and the yard. Something told them that the newcomer was their enemy and that he had come to do them harm.

The butcher bird remained around the courthouse for two days, hoping, no doubt, that he might get a fair chance at the sparrows, but they all "lay low;" not one was seen, but an occasional little chirp was heard from under the eaves, where they were safe and snug.

On the morning of the third day a man who saw and recognized the cannibal got a gun and shot him, and the moment he had done so the sparrows came out of hiding and went about their business as happy as they could be.

An Early American Botanist.

BY SUSY C. FOGG.

It is no surprise that botany should be among the oldest of the natural sciences, for, after the contour of a landscape, is there anything that engages the eye more quickly than its vegetation?

In a new country, also, the first settlers are confronted with the serious problem of getting a continuous and nourishing food supply, a relentless spur toward investigating and making use of every available natural production.

The delight of the early botanist at being placed in the midst of so rich a flora as that of the North American continent must have been strongly offset by the dangers and difficulties of travel and communication in those days together with the scarcity of books of reference and the defects of the old systems. When all is considered it is marvelous that our early scientists were able to compile lists and make collections which should be of permanent value.

In looking over an old volume, I read that "One of the earliest productions if not the very first, descriptive of North American plants, was a quarto volume, printed at Paris in the year 1635, entitled Canadensium Plantarum aliarumque nondum editarum Historia; by a French botanist, named Jac. Cornutus. This author, it is believed, was never in America, but described the plants from specimens sent to him from Canada."

Another work, entitled "New England's Rarities," appeared from the hand of John Josselyn, an Englishman who gathered his observations while living for a time in Massachusetts. This book must have been truly interesting reading; the mention of frogs a foot high makes our present day types appear so pitiably small and shriveled, and the statement that "Barley frequently degenerates into

Oats" would seem to indicate that the sowing of crops was a precarious business in the "Old Bay State."

Later a catalogue of Virginian plants was prepared by one Rev. John Banister, who illustrated some of the rarer species by his own drawings, but the real pioneer of early botany was John Bartram.

His great grandparents lived and died in Derbyshire, England; the grandfather, John, son of Richard Bartram, removed to Pennsylvania with his family and settled near Darby in the same year that the city of Philadelphia was founded. His son William became the father of John, the botanist, who was born March 23, 1699. This John improved the meagre opportunities of getting an education at that primitive date and early turned his attention to farming. At the same time he was keenly observant of all things in nature, studied medicine and surgery and read such of the Greek and Latin classics as he was able to procure.

This does not read so unlike the story of many an enterprising boy destined to become well known in our nation's history, and many of our physicians have been good botanists, so it was quite natural that young John Bartram should become especially interested in the study of the plants whose healing properties he so eagerly sought.

No other scientist of that date brought to notice so many of the undescribed species in this country, and he likewise established the first botanical garden in America. One hundred and seventy-five years ago the coming month, a tract of land was purchased on the right bank of the river Schuylkill below the city of Philadelphia, and herein was collected a great variety of trees, shrubs and plants, the fruits of his travels, together with those species received in exchange from the Old World.

This garden comprised several acres, and grew, we are

told, luxuriantly for there was bestowed upon it all the loving arrangement and care which plants crave.

The second botanical garden in America was established also in Pennsylvania, Chester County, by Humphrey Marshall. His example was followed by others, and fine collections of forest trees were early made. Famous gardens have since been instituted at New York, Cambridge and Charleston, S. C.

At the request of some of the European naturalists, John Bartram performed a series of experiments on the Red Campion, *Lychnis dioica*, to demonstrate the theory of sexes in plants, as James Logan had done with the Indian corn.

John Bartram appears to have been lovable and virtuous as a man, as would seem consistent with his chosen line of work, and the following quaint extracts from letters contained in a biographical sketch bring one close to the man himself.

Peter Collinson, a London correspondent, in writing to Dr. Colden of New York, says of John Bartram—"I am persuaded you would have been pleased with him; you would have found a wonderful natural genius—considering his education, and that he was never out of America, but is an husbandman. His observations and accounts of all natural productions that happen in his way (and I believe few escape him) are much esteemed here for their accuracy." Dr. Colden, in a letter to P. Collinson, says—"I had the pleasure of seeing Mr. Bartram at my house, this summer. It is really surprising what knowledge that man has attained merely by the force of industry and his own genius. He has a lively fancy, and a surprising memory and indefatigable disposition." Dr. Garden to Dr. Colden writes—"One day he dragged me out of town, and entertained me so agreeably with some elevated botanical thoughts on oaks, ferns, rocks, etc., that I forgot I

was hungry till we landed in his house, about four miles from town."

His biographer, Dr. Darlington, says: "Mr. Bartram was a man of modest and gentle manners, frank, cheerful, and of great good nature; a lover of justice, truth and charity. His humanity, gentleness and compassion were manifested upon all occasions, and were even extended to the animal creation. He was never known to have been at enmity with any man."

* * *

A short time since "we seven" spent a day upon the road.

For several years during the picnic season, Tower Hill in a neighboring township had been the Mecca of our hopes and desires. Why it was so desirable to go there, we never questioned, but other pilgrims had attained the shrine, and the little grove crowning the hilltop certainly looked enticing across the waters of Massabesic.

The ride by steam and trolley ended, we started on our several-mile tramp. The time allowance and distance did not permit us to turn aside from the beaten road, but one of our greatest delights of the day was the abundance of wild flowers which lined the highway.

The frequent overlapping of the seasons often gives to any one month an increase in the floral calendar, and a half hundred or more species were easily counted by the most casual observation.

I could not help thinking, as I walked along, how largely conditions of life and travel, in most parts of the country, had been modified since the days of John Bartram, and yet, here, doubtless, were many of the flowers that he knew, blooming on for us, as they had done for him.

As we stood upon that low, rounded summit, trying to grasp a picture which should be forever ours of that beautiful blue horizon of western hills and mountains, or turned again to the bright flowers along the wayside which had

suggested the name of the early botanist, we might well be filled with the story of the past and the promise of the future.

The River Haunt.

BY ALICE B. WAITE.

Where pale willows dip to waters
That reflect the skies soft blue,
Where the breezes sway young grasses
From darkening green to silver hue;

Where the reeds and rushes quiver
To the touch of swallow's wing,
As they lightly skim the river
'Long the banks in flashing ring;

Where "marsh-nuns," 'mong the blue flags,
Brilliant pose for moment's rest,
Where "amber-wings" brightly gather,
A glittering host o'er water-cress;

Where the "red-wings" 'mong the alders
Weave their dainty cradled nest,
Trilling low their tender warblings,
To and fro on loving quest;

Where the waves caress the lilies,
Lilies caress my light canoe,
Beneath the overhanging willows
Where the twilight glimmers through—

Here you'll find me oft at evening,
Beside the reedy stream along;
Bird and flower and brook invite me
To sing their lives in joyous song.

South Lyme, Conn.

In truth, it is a thing to confound and almost terrify the imagination, to think that a grub, at the outset no bigger than a thread, should include in itself all the elements of its moultings and metamorphoses; should contain its triple and even octuple envelopes; nay, more, the sheath or case of its nympha and its complete butterfly, all folded up one in another, with an immense apparatus of vessels, respiratory and digestive, of nerves for feeling and muscles for moving!—*Michelet.*

Nature Study and Culture.

We have become convinced that some intimate, sympathetic acquaintance with the natural objects of the earth and sky adds greatly to the happiness of life, and that this acquaintance should be begun in childhood and be developed all through adolescence and maturity. A brook, a hedgerow or a garden is an inexhaustible teacher of wonder, reverence and love.

The scientists insist to-day on nature study for children, but we teachers ought long ago to have learnt from the poets the value of this element in education. The idea of culture has always included a quick and wide sympathy with nature, and particularly with its living forms, a sympathy based on some accurate observation of nature.

* * * * * * * * * * *

Let us as teachers accept no single element or variety of culture as the one essential; let us remember that the best fruits of real culture are an open mind, broad sympathies and respect for all the diverse achievements of the human intellect at whatever stage of development they may be today—the stage of fresh discovery, or bold exploration, or complete conquest. The moral elements of the new educatiou are so strong that the new forms of culture are likely to prove themselves quite as productive of morality, high-mindedness and idealism as the old.—*From the presidential address of Dr. Charles W. Eliot, before the National Educational Association.*

Not only the song birds of Massachusetts are in danger of extermination, but our best loved wild flowers as well. Everybody knows that the trailing arbutus is yearly growing painfully scarce' and now we read that the lily ponds, too, are having such raids made upon them by people over-anxious to make a few cents clear profit, that they are rapidly being cleared of the beautiful, waxen-petaled flowers. In this case it cannot be said that woman's vanity is to blame, unless her love of flowers and her willingness to pay money for them is so construed. It is the commercial spirit, and the habit of vandalism that prevails among those who take no care about pulling roots and all, that does the mischief.—*Lowell (Mass.) Citizen.*

Nature Study Lessons. XV.

BY EDWARD J. BURNHAM.

August and September are good months for the general collecting of insects for nature study. The specialist, of course, will miss some species that were to be found earlier in the season, but an hour's work with the net on any bright day in late summer and early fall will secure many specimens of each of the seven kinds which we proposed to assort into seven piles, which may then be pinned in as many rows, or as many boxes, to be farther divided into smaller groups later on.

So, in this lesson, we will complete the seven piles, or grand divisions, or orders, in which we may put all the kinds ot insects that we shall ever find.

When the children, from the collection they have made, have placed the beetles in one pile, the bugs in another, the butterflies, moths and skippers in a third, and the flies in a fourth, they will be sure to find in the still unsorted insects a great number of grasshoppers and crickets. Quite likely, too, at this time of year, they will have some of the awkward, slender creatures called walking-sticks, and some cockroaches. If they live in the South, or in the southern middle States, they may also have a praying mantis.

These insects differ greatly in appearance. Some are of one color, and some of another; some have long hind legs for jumping, like the crickets and grasshoppers; the cockroaches have legs fitted for running, while the walking-sticks can best cling to the twigs of the trees upon which they live, and can scarcely run at all. But they all have one thing in common, and that is, that they have mouth-parts for biting, instead of beaks and tubes and tongues, like the bugs and butterflies and flies, and yet their jaws are not like the jaws of beetles. It is easy to

pry open the mouth of a grasshopper or cricket and of a beetle, and see the difference.

Another thing that they have in common is the structure of their wings, when they have any—and even the walking-sticks in the tropics have wings, although those in the North are wingless. All the insects of this kind, like the grasshoppers, crickets, cockroaches, walking-sticks and the mantis, have wings with many "veins," or ribs, that are straight and parallel, or nearly so, from the base of the wing to the tip, or apex, and the wings themselves, when not in use, are folded up like a fan. All insects with this kind of wings belong to the order Orthoptera, or "straight-wings." The grasshoppers, some with long horns or antennæ, and some with shorter ones, the crickets, the cockroaches, the walking-sticks and the mantis belong to this group, or order, of straight-winged insects, and should be put in a pile by themselves. Later, when they have been pinned, and we can study them at leisure, we shall find that the grasshoppers may be separated into two smaller groups, or families, the crickets into another family, the cockroaches into another, and so with the walking-sticks and the mantis, each in family groups by themselves—each having some characteristic that the others do not, although they all have biting mouth-parts and straight wings, and so belong, all together, in the order Orthoptera.

Next, let the children select the bees, wasps and other insects that look somewhat like them and have four wings, by which they are distinguished from the true flies, with only two wings, that often resemble, or "mimic," them. Some of these insects have long tongues, like the bumble-bees, while others, as the wasps, do not; but many have jaws, and some have very stout ones, with which they bite and chew, killing and eating other insects, and even making wood into paper for their nests.

Thus there is a great difference in the mouth-parts of

the little bees sucking honey from flowers with their long tongues, and the ants and wasps biting and chewing with their stout jaws; but these and all their kind have four thin wings, with the hind pair the smaller. These thin wings are said to be "membranous," and so all the insects of this group belong to the order Hymenoptera, or "membrane-wings." For even the ants have wings for a short time once in their lives, and September is the best month in the year to observe the winged swarms as they rise from the ground and fly high in the air on a nice, pleasant afternoon.

The order Hymenoptera is a very large one, and includes not only the bees and wasps and ants, but ichneumon-flies, which pierce other insects with a sort of sting and lay eggs in them; saw-flies, with tiny saws, with which they cut slits in leaves, where they place their eggs; gall-flies, that cause the galls on the oaks and on many other trees and plants; and horn-tails, with long, stout borers, with which they drill deep holes in solid wood.

The bees and wasps are very numerous in early fall, and will be found in great abundance about fruits and flowers. There are many groups, or families of them, as of the gall-flies and others of the order, and sometime we will learn to separate them into these smaller groups; but for the present it is enough to select the insects with two pairs of thin, or membranous, wings, and put them in one pile, or pin them by themselves in a box labeled Hymenoptera.

When six piles have been made from the day's collecting, the seventh and last pile is, of course, made also, for it contains all the insects that remain. In this respect, the pile is quite typical of the order, which includes groups so widely unlike that some scientists have made as many as twelve orders from it. The children, however, should at first consider all insects with four wings alike, nearly of a size and marked with many fine veins, as belonging to

one order, leaving the scientists to continue the dispute among themselves, although they do not seem in the least likely to settle it.

The veins in the wings of insects were formerly called nervures, or nerves, and from the fact that the insects of this group have wings with many such veins, or nerves, they were named Neuroptera, or "nerve-wings."

The Neuroptera have long, slender bodies and large wings, and of this type of insect perhaps the dragon-flies, or "darning-needles," are the best known to the children, by reason of the silly fear which many people have of these beautiful and harmless insects.

In woods and orchards, at this time of year, the pretty, bright-green lace-winged fly, Chrysopa, or "Golden-eye," is very common, and is almost certain to be found in the collection. The may-flies, stone-flies and caddice-flies also belong to this order, and although most of them appeared earlier in the season, a few will still be found by the brooks as late as the middle of September.

We have now made very considerable progress in the work of classification in one great branch of the animal kingdom. We have learned that there are several types of jointed creatures, as the millipedes and centipedes, with many legs, the spiders and harvestmen with eight, and the true insects with six. Each of these types constitues a class, and thus the insects are in a class by themelves. The jointed creatures, taken all together, belong to a single *Branch* of the animal kingdom; the insects, taken together, comprise what is called a *Class*—the class Hexapoda, or six-legged creatures. This class again, as we have seen, is divided into smaller groups, called *Orders*.

In separating the insects in our collection into piles, or orders, we have found that all those in each order have something in common which other insects do not have. The beetles have wing-covers which meet in a straight line

down the back; the bugs have sharp, jointed beaks and wing-covers that are half thick and half thin; the butterflies and moths have wings that are covered with fine scales; the flies have only two wings; the grasshoppers, crickets and their kind have wings with straight veins, like the ribs of a fan; the bees, wasps and their cousins have four thin, membranous wings with few veins; the dragon-flies, may-flies and their kind have large, thin wings with many finely-netted veins.

Having learned to distinguish the insects from other jointed creatures, and to determine the order to which each insect belongs, we have added to our store of knowledge and greatly increased our capacity for innocent enjoyment and recreation—no small matter in what is too often made a mere workaday world. It has taken but little time, has been a pleasure in itself, and has cost almost no money at all. Better still, the knowledge gained will stay with us through life, will add to the enjoyment of every walk abroad, and will increase our interest in much that we read; for so much attention is now paid to insects that one is constantly coming upon allusions to them.

So, if we never do more in this direction than to make our seven piles of insects, or place them in seven rows, or, better, pin them in seven boxes, it has been well worth while. But few children, or grown people either, when they have once begun, are willing to stop here. Having learned to classify things, to separate one group from another, they soon perceive that some of the insects in a row, or box, or order, have something in common which other insects in the same order do not have. Therefore, the order can be divided naturally into smaller groups, and these groups are called *families*.

There are many more families than there are orders, as there are more orders than classes and more classes than branches in the animal kingdom. To learn all the fami-

lies of insects requires a great deal of study and a very large collection, but we shall find it a real pleasure to become familiar with such as we can have readily at hand. So, in future nature study lessons, we will take our rows or boxes of insects and learn something about a few of the more common families in each of the seven orders.

A Gift from Nature.

BY CHARLES H. OAKES.

A full moon reigning in proud majesty;
Some sickly stars acowering from her light;
Crabapple scent low floating o'er the lea;
A field-sparrow's wail startling hush-wrapped night—
Nature clipt out this night from her vast store,
And handed me to keep forevermore.

In the turning of the human tide cityward, which will begin before long, how many will come back rested? How many really know how to rest? What proportion of us understand the wisdom of the wilderness where the trammels of conventionalities are unknown and the soul and body expand together in the vast harmonies of nature, where everything is pure and free, and where the civilization is from God's own hand? The nearer one gets to the peace in unity that pervades a great wilderness, those immense stretches of forest where the silence is only broken by the song of a bird or the cry of an animal, the stronger he is for his life work when he returns to it.

And yet there are comparatively few on whom the silence of the wilderness would not pall. A fashionable hotel in the hills is the Mecca of the crowds. A "hole in the wall" to look at the world from is the size of the observation from most hotel rooms where the clatter of humanity drowns the song of the trees. And who shall teach the wisdom of the wilderness which shall minister to these diseased tastes that prefer the flesh-pots to the sweets and virtues of the ground, the waters, the plants, the heavens and all that weave their enchantments therein?—*Listener, in the Boston Transcript.*

Radium and the Glow-worm.

Radium is the latest wonder of the scientific world. The glow-worm is one of the oldest of the mysteries which have attracted the study of naturalists. It may be that the knowledge gained from radium is to teach us at last how the glow-worm emits its flashes of light.

The suggestion is made by Sir Oliver Lodge in the July number of *The Ninteenth Century and After*, not as a result of study, but as a hint to investigators. It comes at the close of a most interesting description of the electric theory of the construction of matter, toward which all the latest discoveries seem to point.

Sir Oliver says that in addition to the forms of energy which have previously been recognized we must now give consideration to the energy of the electrons, or parts, of which the atoms of matter are hypothetically composed. As atoms break up and bombard the world with their electrons the flying fragments sometimes strike a phosphorescent obstacle and make a flash of light, and sometimes they strike other atoms of the same subject and their energy subsides into heat. Sir Oliver describes these processes and tells also of the various forms of rays that are emitted and their qualities.

"Can it be," he then asks, "that the light emitted by the glow-worm is emitted because the insect has learned how to control the breaking down of atoms, so as to enable their internal energy in the act of transmutation to take the form of useful light, instead of the useless form of an insignificant amount of heat or other kind of radiation effect?"

If the long and laborious work of M. and Mme. Curie, by means of which they succeeded in extracting a minute quantity of a new element from tons of a useless mineral, pitchblende, is thus to have the indirect result of teaching us how the glow-worm is able to glow, it will be a most curious illustration of the way in which all the forces of the universe are bound together, so that the knowledge of no one of them is without importance to us in the understanding of all the others.—*Chicago Record-Herald.*

And yet I connot fly from them: swarms haunt the very air which I breathe—what do I say? float in the fluids of my body. It is my interest to know them. But my sovereign interest is to escape from my deplorable and wretched ignorance, and not to quit this world until I have peered into the infinite.—*Michelet.*

Wonderful Plant Mimics.

Insects of very different kinds imitate other insects, or inanimate objects, either for self-protection or to get food. But it is a much rarer thing to see plants sailing under false colors. The so-called "living stones" of the Falkland islands are quite the most startling instance known. The Falklands islands are possessions of ours which lie off the coast of Patagonia. They are invaluable for the excellent grazing they afford for sheep, but they are so constantly swept by bitter antarctic winds that ordinary trees will not grow upon them.

Nature, however, has made amends for this lack of timber. The visitor to the islands will find here and there large areas strewn with what appear to be lichen-covered boulders. It is not until he attempts to move one of these stones that he discovers that the object is not what it seems. It is anchored to the ground by tough roots, and is, in fact, not a rock but a tree without branches or leaves. These "living stones" are very hard to cut, as they have hardly any grain. But they burn well, making a very hot fire.

Other plants seem to take a mere freakish pleasure in suddenly altering their usual characteristics and looking like something quite different. The cockscomb of our gardens is, in reality, nothing but the common pigweed. The cockscomb has been enlarged by constant cultivation, but it was originally nothing else but pigweed, masquerading under a new form.

Similar to this is the plant named in seedmen's catalogues "digitalis monstrosa, or the "monstrous foxglove." To look at it, no one would be likely to connect it with the ordinary foxglove, for its flowers are flat and two or three inches across. Yet it is not a cross, but only a freakish form of the ordinary wild foxglove.

Some of the most startling of all mimics in the vegetable world are to be found among the fungi. One of them, known as the Jew's ear, and occasionally found in this country, has gained its name from its exact resemblance to a human ear. Another, known as the aserve, is the living image of a sea anemone, while the fungus called oleaster might be taken for a dead starfish.—*London Answers.*

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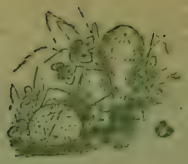

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BALD HEAD CLIFF.

PHOTOGRAPHED BY W. H. HUSE.

NATURE STUDY.

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VOL. IV. September, 1903. No. 4.

Bald Head Cliff.

BY WILLIAM H. HUSE.

Sojourners along the coast during the vacation season have exceptional opportunities to study the work of the waves in changing a coast line. Ceaselessly dashing against rocky bluff and sandy beach, they wear away the former and modify the latter. It is on the rocky cliff that summer visitors love to sit and watch the spray as waves loaded with sand or pebbles dash against the rocks again and again and ever again, fit symbol of eternal force. They are mills of the gods at work upon the shore line of the continent. It is difficult to realize that the water is wearing away the rock, but we know that during the ages that the ocean waves have dashed against the ledge, the latter has been worn down to the form and position in which we now see it.

The rock is full of joints and cracks from pressure or contraction, and here the forces of nature find a foothold. Frost may begin and make a crack larger. Then it is easy for the waves to pound off fragments with a rock for a ham-

mer and the wearing away of the cliff goes on. It continues irregularly, for in some places the rock is more easily disintegrated than in others. Little bays, narrow inlets, capes and cliffs are the result.

One of these last is Bald Head Cliff, situated about half way from York Beach to Ogunquit, Maine. The face of the cliff as shown in the frontispiece is the side of a dike of igneous rock that is less easily eroded than the surrounding slate and sandstone. The dike is about fifteen feet thick and rises seventy-five feet above the water. On the other side the stratified rock is not worn away so much although it is somewhat lower than the dike. Here are seen the forces of the ocean in all their might. Here one can sit and never tire of the ceaseless pounding of the waves and the never-ending flow of the tides. The cliff, the spray, the clouds, the sky and perchance a gull, make a picture that delights the eye. The waves make music for the soul. Here is a bit of grandeur that is worth a journey to see. If it were farther away it would be more noted.

How a Bird Dresses.

A recent writer thus discourses on birds and their toilet: As bird fashions do not change, the lady birds of to-day wear the same kind of dresses their grandmothers wore and are never troubled about styles.

Two suits a year are quite enough for most birds, but they need to take great care of them. Each separate feather must be cleansed and looked over and the useless ones pulled out.

You have seen a canary preening his feathers by lifting them and smoothing them out with his bill, and you may have thought him vain to do this so often. But necessity, and not vanity, is the cause of his frequent dressings. If you neglect to comb your hair it will become tangled and

look untidy—but more serious things happen to a bird who does not comb his feathers.

These feathers are not packed close together, you know, but lie loose, and have places between filled with air. When a bird wants to get warmer he lifts his feathers so that these air spaces may be larger, but if his feathers are tangled or wet and dirty he could not raise them, and soon he could not keep the heat in his little body, and would die, of course.

Perhaps you have noticed sparrows or other birds in the winter time. They always look larger, but they have only fluffed out their feathers because the weather is cold. Mr. Canary does the same thing when he goes to bed at night. A water bird has to be even more particular about his clothes, for if he should get them wet he would die of cold.

It seems odd, does it not, that he can go in the water and not get wet? It is a fact, though, and it is only because he oils his feathers. All water birds have an oil can, or oil gland, as it is called, located down among his tail feathers, and after he has smoothed himself carefully he reaches his head down to the oil gland and gets a nip of oil in his bill and with it he oils his feathers with the greatest care. If he does it properly the water will run off and not soak in the least bit. Just watch a duck when you get a chance and see how he does it.—*Milwaukee, Wis., Sentinel.*

The height at which birds fly, even in the finest weather, is apt to be grossly exaggerated, since well-meaning but inaccurate people commonly talk of seeing wild fowl "miles high," oblivious of the fact that their normal vision would never at such a range include birds at all. Baloonists have better opportunities for something like exact observations however, and some aeronauts have, in fact, recorded interesting statistics of bird altitudes. Thus, Hargesell, of Strassberg, encountered an eagle at the prodigious height of two miles (more exactly, 3,280 yards) while he also found storks and a buzzard at something just short of 1,000 yards.

A Cosmopolitan Colony.

BY N. G. SAXTON.

As autumn advances, the birds which have filled our woodlands with song during the summer months seek warmer climes in which to pass the winter. All do not leave us, however; indeed it is surprising how many of the birds which we regard as only summer visitants may be found in sheltered ravines. Walking over the snow-covered hills one morning in December, I came upon one of these cosmopolitan colonies of feathered folk, all as gay as if summer had not passed and cold winter taken its place. There were robins, blackbirds and stonechats hopping about among the leaves; hairy woodpeckers darting about decaying tree trunks in search of grubs; a fly-catcher and a bluejay were quarreling over an acorn, while near by, several wood bluebirds hopped quietly about, picking at buds and roots. There were many goldfinches, their coat of black and gold faded until they closely resembled their relatives, the sparrows. They looked as if they had been caught in a sudden shower and all the brilliant coloring washed from their feathers.

Among the birds which collect in ravines where the tall weeds and rank undergrowth afford ample shelter from cold winds, none is more striking in appearance than the Cardinal Grosbeak, whose gay coat is always conspicuous among his somber-hued companions. If there is a cedar in the ravine there you will find Cardinal. His song swells loud and clear on the morning air with wonderful sweetness. Cardinal is a shy bird and will not allow close aquaintance. During the winter you may by patient trials win his friendship and confidence, but at the first suspicious move he is off.

The jolly red-head woodpecker is in the motley gather-

ing, too, searching for dainty morsels in the form of grubs. As he swallows them he utters a satisfied cor-r-ruk, and renews his search. Chickadees, wrens, song sparrows and bluebirds are among the number, all living in harmony, though at other seasons they may be enemies. During the cold months hostilities are suspended and all live peacefully together until the coming of spring shall dissolve their partnership.

Camp Dennison, Ohio.

The Story of the Strawberry.

The Indians have many stories, designed to explain things. They are not always true—perhaps never are wholly true—but are nearly always interesting. Mr. James Mooney, who has spent a great deal of time among the Cherokees, has learned many of these tales and translated them into English for the Bureau of Ethnology at Washington. One of them explains the origin of the strawberry in this way:

"When the first man was created and a mate was given to him, they lived together very happily for a time, but then began to quarrel, until at last the woman left her husband and started off toward the Sun land, in the east. The man followed alone and grieving, but the woman kept on steadily ahead and never looked behind, until the Great Apportioner (the Sun) took pity on him and asked him if he was still angry with his wife. He said he was not, and the Sun then asked him if he would like to have her back again, to which he eagerly answered yes.

So the Sun caused a patch of the finest ripe huckleberries to spring up along the path in front of the woman, but she passed by without paying any attention to them. Farther on he put a clump of blackberries, but these also she

refused to notice. Other fruits, one, two, and three, and then some trees covered with beautiful red service berries, were placed beside the path to tempt her, but she still went on until suddenly she saw in front a patch of large ripe strawberries, the first ever known. She stooped to gather a few to eat, and as she picked them she chanced to turn her face to the west, and at once the memory of her husband came back to her and she found herself unable to go on. She sat down, but the longer she waited the stronger became her desire for her husband, and at last she gathered a bunch of the finest berries and started back along the path to give them to him. He met her kindly and they went home together."

Reproducing Bird Songs.

Based on experiments conducted by Professor Sylvesta D. Judd, a project is mooted among scientific men to secure graphophone records of the songs of birds, the roars and cries of mammals and all available animal notes for the purpose primarily of assisting nature study in American schools, says the *Saturday Evening Post*. Dr. Judd inaugurated the work by securing the songs of several species of birds. Meeting with some difficulty in obtaining the recording cylinder necessary for his purpose, he succeeded in manufacturing one himself and then patiently taught a captive brown thrasher to sing into the horn. At first the sound of the revolving apparatus disconcerted the thrasher. Removing the recording style, the scientist let the cylinder revolve indefinitely until the bird became accustomed to the whir. After a little, the thrasher, known also as the brown thrush, resumed its singing, and then the graphophone was adjusted to secure a record. From a near by hiding place the ornithologist controlled

the revolutions of the cylinder by means of a wire, shutting off the current the moment the thrasher's song became weak or faltering. In this way was secured a perfect record of the bird's exquisite melody. Its volume and timbre were pronounced faultless by the American Ornithologists' Union, before whose session the graphophone record was produced.

With equal success Dr. Judd has been experimenting with other birds, and his achievements are attracting attention in the scientific world. The educational possibilities of the undertaking are generally conceded. Nature study in schools just now is receiving more attention than ever before in history, particularly along lines of direct economic interest. Now that many species of valuable birds are threatened with extermination it is regarded as especially important that the growing generation be made conversant with American bird life. Students taught from childhood the sounds of birds faithfully reproduced by graphophones in the schoolroom would be able instantly to recognize various species singing in the woods and fields.

Resting in Midair.

"While I never have seen it explained in print," said one of the ornithological sharps of the zoo, "it is a wonder to me persons should express amazement at the ability of certain birds to hang poised in the air without wing motion.

"It is a favorite trick of the great condor. Away in the air, far beyond the mountain tops, these birds hang poised as motionless as if perched on solid rock. True, their wings are outstretched, but even through glasses not the slightest motion is perceptible. They remain in this position for many minutes, sometimes for an hour, making a careful scrutiny of everything below them in their search for prey. Then, with a slight tilting of the wings, they flap slowly away, or, having found what they were seeking, dart like a bullet toward it. The eagle, hawk and other species have this same faculty of poising apparently on nothing.

"These birds move about until they meet an uprising current of air. It may come from immediately beneath them, from wind deflected by striking a cliff along the sea, or may come from a great distance, where a rushing wind struck the side of a mountain and was turned upward. Being on the wing most of the time in search of prey, they have learned to utilize these uprushing air currents for their own purposes. Coming to one of these and heading to the wind, they fix their pinions at an angle which will permit them to rest there and scrutinize something that has taken their attention perhaps on the plain below. Thus, while they seem poised on nothing, the air current rushing upward buoys them.

"You see the same thing in midocean when ships are followed by flocks of gulls, in some rare case clear across the ocean. When the ships start out the gulls fly here and there, sometimes away on high and skimming the surface of the water in search of food. As the hours and days pass they tire, and then you will see them poise for rest on the air current rising from the stern of the ship. The onrush of an ocean greyhound creates a swiftly rising air current in its wake. This curls over like a wave and rushes into the vacuum made by the steamer, and on it the gulls are carried along without effort and at the same speed at which the ship is traveling." —*New York Press.*

Song of the Wild-wood.--Nature's Joys.

BY ALICE B. WAITE.

Loving Nature, the wild-wood bee,
Bird, flower, and whispering tree,
Loving Nature, my heart-strings
Are tuned to bird of free wings.

Watch the clouds gathering o'er,
Watch the rain drops swift down pour,
Raptured are the wild-wood flowers
Raptured by the sudden showers.
Gladly sing, O poplar leaves
Caressed by refreshened breeze.

See the wood duck of the pool,
Bathing near the lilies cool,

Scarlet breasts the ripples lave,
Scarlet dips the current wave.
Watch dragonfly darting up,
Rainbow flash o'er lily-cup,
Purple crest, silvery wing,
Restless life, O, insect king.

See the wood cock of the brake,
Fledglings follow in her wake,
Downy balls of soft delight,
Downy balls of yellow light.
Watch gray squirrel frisking down
'Long the tree trunks mossy brown.
Chattering gray, bounding on
Through the brambles—now art gone.

Hark! afar, the hermit thrush,
An anthem clear, from underbrush.
Hark! now near, the vireo sweet,
Trilling from wild-rose retreat.
Both warbling, a glad refrain,
Both singing, "O come again."

So my heart, interfested,
Sang of bird, or lily-head
Nodding bright 'long forest trail,
"Wood nymphs" of the ferny vale.
Foxgloves, too, smile by the way,
Orchis and pipsisewa,
Star-flower, luminous white,
All wood-blooms to give delight.

Loving Nature, the wild-wood bee,
Bird, flower, and whispering tree,
Loving Nature, 'tis all divine,
For their joys and bliss is thine.
Half their joys I have not told
For their joys are manifold,
Of their lives I gladly sing
Blith as songbird of free wing.

South Lyme, Conn.

The Wild-Rice Indians.

BY EDWARD J. BURNHAM.

When Sieur Jean Nicollet, in 1634, first visited Green Bay, on the western shore of Lake Michigan, he found there a tribe of Indians lighter in color than their neighbors and remarkably well formed. They subsisted largely on wild rice, called in their language "manoma"—from which they took their name, Menomini (wild rice men).

The wild rice, upon which these Indians fed and grew to such fair proportions, is the *Zizania aquatica* of the botanies, a single-stem water plant, belonging to the grasses, a member of that useful family of which Mr. Batchelder has written so entertainingly in previous numbers of NATURE STUDY.

The grain or kernel of wild rice is a slender cylinder in form, about half an inch long, and of a dark slate color. Each grain is enclosed in a husk, or glume, and each husk has a beard, or awm, about an inch in length. These glumes grow in clusters, called panicles, much like the heads of oats.

The grain is shed into the water when it ripens in the autumn, and lies in the soft ooze at the bottom of a lake or river until spring, when it germinates, or sprouts, and the shoot grows rapidly to the surface of the water, where it appears early in June and at once begins to prepare its head. Catharine Parr Traill, in her "Backwoods of Canada," has thus described the plants at about this stage:

> When seen from a distance, they [the rice beds] look like low green islands on the lakes; on passing through one of these rice beds when the rice is in flower, it has a beautiful appearance with its broad grassy leaves and light waving spikes, garnished with pale yellow green blossoms, delicately shaded with reddish purple, from beneath which fall three elegant straw-colored anthers, which move with every breath of air or slightest motion of the waters.

The plant blossoms in June, and by September the seeds are mature. The stalks vary in length from two to twelve feet, and will grow and mature in water from one to eight feet in depth. It is believed that it grows in suitable locations in every State east of the Rocky Mountains. Indeed, it has been reported from all but two of them—Tennessee and West Virginia. But it is in the ponds and lakes spread out over Wisconsin and Minnesota, where the last glacier left numerous mud-bottomed, water-filled hollows, that it grows most abundantly, and it was there that the Indians learned to depend upon it for a considerable portion of their food supply, and fought many terrible battles among themselves for the possession of the rice beds.

The story how the facts concerning the wild-rice gatherers came to be collected and published is itself interesting, and shows how great opportunities sometimes lie about, waiting for someone to improve them. It had long been known that certain tribes of Indians, gathered, stored and used wild rice for food, but the knowledge was exceedingly vague until Dr. Albert E. Jenks, an advanced student in the University of Wisconsin, undertook to collect the references to the use of wild rice scattered through early and rare literature pertaining to the Indians, which he found in the library of the Wisconsin Historical Society. He had found something worth doing. His interest grew, and he began making inquiries about the use of the plant by Indians now living. He also got a chemist at the university to make a thorough analysis of the rice, to determine its food value, which is very high, for wild rice contains just the substances which the human body needs to nourish and strengthen it. Then the Bureau of Ethnology at Washington heard what Dr. Jenks was doing, and commissioned him to go to northern Wisconsin and Minnesota, where the wild-rice crop is still harvested annually.

The result is a long and interesting paper, or "memoir," concerning the entire subject, which has now been published in a report of the Bureau. Dr. Jenks found something worth doing, and did it well.

Dr. Jenks learned, by his researches, that before the middle of the seventeenth century, more than 250 years ago, wild rice had been reported as the staple food of the Menomini Indians, who found it very abundant on the Menomini River, the boundary between Wisconsin and the upper peninsula of Michigan. But these were not the only Indians who knew the value of the wild-rice fields. The Sauks and the Foxes, the Ojibwa, or Chippewa, the Dakota, or Sioux, all struggled for the prize of abundant food, and in some cases nearly exterminated one another by their fierce battles.

Then came the white man, who at length prevailed, and now the Indians remaining on the reservations gather the wild rice in peace, but in much the same rude way as in former times. The Indians learned long ago that they must in some way protect their prospective harvest from the great flocks of wild fowl which came to feed upon it. So, sometime in August, the Indian women, to whom most of the labor falls, set out in bark canoes, two in each, with great balls of string made from the tough inner bark of the linden, or bass-wood trees. This ball of rude string is placed in the canoe behind the woman who is to do the tying, and the string is drawn over her shoulder, through a loop in her clothing. A stick, curved like a sickle, is used to bring a bunch of heads together, when they are twisted, bent over and tied. In this way, most of the rice in the bundle is protected from the birds and prevented from falling into the water when ripe. When a bunch has thus been tied on each side of the canoe, the woman in the stern paddles along a few feet, when two more bunches are gathered and tied up. In this way long

rows are formed of tied up rice, still standing in the water to ripen.

A few weeks later, along in September, when the rice has ripened, the women go in their canoes between the rows of bunches, and while one paddles slowly, the other beats the heads over the edge of the canoe with a sharp piece of wood, thrashing off the hulls with the kernels of rice in them. When a canoe load is thus secured, it is taken ashore and emptied.

Of course the kernels must be separated from the hulls, and this part of the work is all that is done by the men in the whole process of rice gathering. A hole is dug in the ground, the rice is put in it, and an Indian treads upon it until the threshing is completed. Then the women winnow the kernels from the chaff in the wind. It is, on the whole, a rather laborious process, but is a much simpler method of obtaining food than preparing the ground, planting, and caring for a crop, as the eastern Indians did in growing their maize, or Indian corn.

Of course there was, in the early days, before the white man came, terrible fighting among the tribes for the possession of the rice-fields. The Menomini Indians were hardy, and appear to have held their own, by constantly fighting for it. But the Ojibwa or Chippewa Indians came from the east and drove away the Sauks and Foxes; and then the Dakota, or Sioux, came and tried to drive the Ojibwa away. But these bought guns of the white men and learned to use them, and thus drove the Sioux to the plains to the westward, to hunt buffalo, while the Ojibwa remained to harvest and eat the rice, which the remnant of their tribe, on their reservation, continue to do to this day.

We comprehended and we loved one another; we interchanged our languages. I spoke for the Bird, and the Bird sang for me. —*Michelet.*

School Trips at Watertown.

School trips form an important part of the school work at Watertown, Mass. They are looked on as a legitimate side of the course of study, and are taken in school hours. An idea of their scope will be given by the following partial list of trips taken during the present school year. For primary grades, visits to the blacksmith, the carpenter, and the farmer, a trip to Longfellow's home, a visit to the Indian room at the Peabody museum at Harvard, trips to ponds, trips for the study and collection of flowers, plants, and leaves, to study and collect insects, to observe signs of fall and spring, visits to City Point for marine life, to Norumbega Park menagerie; for geography, visits to the rubber works, the iron foundry, the woolen mills, the market gardens, visit to a Chicago train at the South station, visits to Cunard and Dominion line steamers, a trip about Boston; for history and literature, visits to the Art museum, the Abbey pictures at the library, to a session of the legislature at the State House, a trip to Concord and Lexington, a visit to the Riverside Press.

These trips were first carefully prepared by the teachers and afterwards written up and illustrated, sometimes with photographs taken at the time of the visit by the pupils. One of the most valuable trips has been the visit to Boston, taken as a starting point for the sixth grade study of geography. Four hours were spent on this trip, the pupils noting the typical sights and many of the historic landmarks of Boston, and visiting, among other points, the subway, the South Station, the shopping district, the press room of a daily paper, the interior of King's chapel, the roof of the Ames building, the State Bouse, and the Public Gardens.

Another side of the school trips, especially of those taken in connection with geography, has been the exchange of pupils' letters with schools in Scranton, New York, New Orleans, Chicago and Pasadena. For the coming school year Superintendent Page is arranging to exchange an illustrated account of a trip about Boston for similar accounts of trips about New York, Washington, New Orleans, and Chicago.—*School Journal.*

Even in its hours of silence, the forest occasionally finds a voice, a sound, or a murmur, which recalls to you the remembrance of life.—*Michelet.*

The Calabar Bean.

The Calabar bean, or *Physostigma venenosum*, is an interesting member of the family of leguminous plants. It gets its common name from that region in Africa near the Gulf of Guinea, known as Calabar where it grows. The bean contains a violent poison which is used in medicine for causing contraction of the pupils of the eyes and in tetanus, neuralgia and rheumatic affections. It is also known as ordeal bean from its use by the negroes of its habitat in witchcraft and similar troubles. The accused is made to swallow a bean. If it kills him he is guilty. If his stomach rejects it and it is thrown up he is adjudged innocent. There can this be said in favor of such a trial, that the accused would have more of a chance than did our ancestors who were tried by means of red hot plowshares.

Fools the Birds.

Owing to the ravages of the yellow hammers, or flickers, workmen have been kept busy in repairing and replacing the posts of the telephone line here ever since the birds arrived in the spring.

While the posts of the telephone and telegraph wires were confined to the cleared land away from the woods there was no trouble in keeping them in good condition for fifteen or twenty years, but when private and public enterprize extended the telephone to remote sporting camps and fishing grounds the flickers began to peck holes in the soft arbor vitae wood, digging galleries far into the heart and making the sticks so weak that they broke off in high winds.

Until the white cedar, or arbor vitae, began to be employed for holding the wires aloft, the flickers did not disturb this species of trees. Most of the work performed by these birds is done upon trunks of white birch, which is soft and very easy to penetrate, and upon such other aged trees as had partly rotted, the decaying wood furnishing homes for insects on which the flickers subsist.

One may search the woods all day and never find a flicker nest in any arbor vitae, spruce or pine. No sooner, however, had the cedar trees been felled and set up along the sides of the roads to hold the wires than every one became the target for industrious birds, which not only dug holes for their nests in the soft trunks, but tunneled the wood in every direction.

Men who have observed flickers at work on the telephone lines say the birds mistake the constant humming kept up by the wires for the sound of insects inside the wood, and that the poles are ruined out of misdirected zeal in pursuit of grubs which do not exist.

A flicker on alighting on the side of a pole will give a few taps with his bill against the dry wood and then cock his head on one side and listen for borers. Hearing the wires singing and humming in the breeze and feeling the pole tremble slightly from the pulsing sound, the flicker reasons that the whole stick is filled with toothsome grubs and at once begins to cut away the wood.

After working until he is tired, the bird stops to listen again, and finding the sound is as loud as ever and apparently deeper in the wood, he resumes his labor, penetrating deeper and deeper until he has bored a hole clear through the stick.

In this manner the flickers have worked day after day, until there is not a whole pole left on any telephone line which runs through the woods. As a new pole is worth $3, and as the cost of cartage is $2 or more, the expense of keeping a backwoods line in repair is more than the companies can stand, and double rates are charged to patrons who desire telephone communications from resorts that are far from open fields.—*Jackson, Mich., Patriot.*

His love of the feathered tribe got Manager E. A. Woelk of the Belleville Bell Telephone Co. into serious trouble Wednesday. Woelk was in the yard at his home when he saw a young cat bird on the ground, apparently hurt. He picked it up and gently smoothed its feathers, trying to see what its injuries were. He had not noticed that there were others of its own tribe who wanted to give the young bird all the medical attention it might require. While tenderly handling the bird, two grown cat birds swooped down on his head and began to claw his scalp. They cut two severe gashes in his head before he succeeded in fighting them off. —*St. Louis Chronicle.*

Nature Study Lessons. XVI.

BY EDWARD J. BURNHAM.

Now that the children have saved the collections of insects that they made during the summer, and have separated them into orders, they will easily perceive, upon observation, that smaller groups may be made from insects of the same order, by putting those together which have a sort of family resemblance.

Thus, if the box containing the beetles, or Coleoptera, is examined, a start may be made by selecting the Potato-beetle, which, of course, every child knows by sight. It has five lines on each wing-cover, and is sometimes called "the ten-liner." Now it is probable that among the beetles there is another, that was found on milkweed in August, of almost the same shape and size as the Potato-beetle, but of different color. It is deep-blue, except the wing-covers, which are orange, with three dark-blue spots on each. This is the Milkweed-beetle, and belongs to the same family as the Potato-beetle.

On the asparagus in the garden, in early spring, when the young shoots were starting, and later, when the branching asparagus was fully grown and had berries on it, there was almost sure to be a small red, yellow and black beetle. It is more slender than the Potato-beetle, and much smaller, but it belongs to the same family, and may be pinned in the same row in the beetle-box. It is, of course, the Asparagus-beetle, which has come to be a great pest wherever gardeners try to grow large quantities of asparagus for the city markets.

There will likely be some Tortoise-beetles in the box. These belong to the same great family of leaf-eating beetles, and are so called because they are flattened, and because they can hide their heads and legs, as a tortoise

does. They are beautiful insects when alive, in bright golden or green, but they lose their colors after they are dead. They live on the leaves of morning-glory, nettle and sweet potato, and will repay us for a careful study of them and their habits another year, now that we have come to know them.

Nearly every child knows the Lady-bug, or at least one species of the family to which the Lady-bugs belong. The old jingle,

> Lady-bug, Lady-bug, fly away home,
> Your house is on fire, your children will burn.

has reference to the shape and color of these familiar beetles, which are very deep for their length and breadth, nearly hemispherical, like half an apple laid flat side down, and generally bright red or yellow, with black spots. A few are black, with white, red or yellow spots. One kind has five spots on the wing-covers, another has nine, and still another has thirteen; but the best-known Lady-bug, in the Eastern States, has two spots, one on each red wing-cover. It is the Lady-bug which children see most frequently, because it is common about the orchard and garden, and frequently hides in houses during the winter, coming out upon the walls and windows in early spring. It is then oftened killed, because of the general prejudice against all insects, but if people knew their habits, they would be kindly treated, as being among our best friends. For, if left alive, these Lady-bugs would soon find their way out of doors where they would deposit great quantities of eggs, from which would hatch active, hungry little creatures that run about over trees and shrubs hunting for other insects, and catching and eating more of them than the farmer or gardener can kill with all his poisonous mixtures.

This little bright red Lady-bug is called *Adalia bipunctata* by the scientists, bipunctata meaning two-spotted.

This and all the Lady-bugs belong to the family Coccinellidae, and they resemble one another so much in shape and general appearance that it will be easy to select them and pin them in a row by themselves.

When the children were collecting, they were sure to find many shiny, black beetles with long legs, running through the grass or hiding under stones and rubbish. They are so common and so easily caught, that some are certain to be found in any collection. Nearly all are shining-black in color, and almost all have the wing-covers ornamented with ridges running lengthwise and rows of pits or punctures between the ridges. In the East there is one Ground-beetle that is brown, but it is shaped like the black ones, and has the ridges and rows of pits, so that it is easily recognized. Another, much larger, called the Searcher, has green or violet wing-covers margined with reddish, and the rest of the body is marked with violet, blue, green and copper. Of course, this beetle is greatly prized by young collectors, and so is the Fiery Hunter, another Ground-beetle, a little smaller, but readily known by the rows of reddish or copperish-colored pits on the wing-covers.

Perhaps the children, in their collecting, caught some Tiger-beetles, although it is not an easy thing to do, for they are the most agile of all beetles, and both run and fly remarkably well. They are beautiful insects, usually of a metallic green or bronze, banded or spotted with yellow, and are to be found on bright, hot days in dusty roads, beaten paths, and on sandy patches where no grass grows. They are sharp-sighted and alert, flying off just before they can be reached, alighting a rod or two ahead, facing about and watching your approach, ready to fly off again. If there are any in the Coleoptera box, they may be pinned in a row and labeled Cicindelidæ. If there is none, they should be remembered as promising rare sport

for any active boy or girl who is willing to work hard for additions to the collection another year.

Everybody knows the May-beetles, or "June-bugs," with their clumsy, blundering ways, and any bright child would be likely to guess that the Goldsmith-beetle is a cousin, and therefore to be pinned in the same row; but the Rose-bug belongs in the same row, too, and that is not so easy to understand, until one learns in how many ways the May-beetles and the Rose-bugs are alike.

There are many more families of beetles, and some that we have not mentioned are almost certain to be found in our beetle box, but this lesson is already a long one. In the next we will learn something more about them, particularly about the Click-beetles, the Long-horns and the kinds that live in the water.

Intelligence of Plants.

Prof. Shaler, of Harvard university, is of the opinion that plants are possessed of intelligence that serves the purpose of self-protection and self-gratification to a very considerable degree. Recently after discussing the automata observed in growing things he said: "We may accept the statement that our higher intelligence is but the illuminated summit of man's nature as true, and extend it by the observation that intelligence is normally unconscious, and appears as conscious only after infancy, in our waking hours, and not always then." In summing up the professor uses the following sentences: "Looking toward the organic world in the manner above suggested, seeing that the unpredjudiced view of life affords no warrant for the notion that automata anywhere exist, tracing as we may down to the lowest grade of the animal series what is fair evidence of actions which we have to believe to be guided by some form of intelligence, seeing that there is reason to conclude that plants are derived from the same primitive stock as animals, we are in no condition to say that intelligence cannot exist among them. In fact, all that we can discern supports the view that throughout the organic realm the intelligence that finds its fullest expression in man is everywhere at work."

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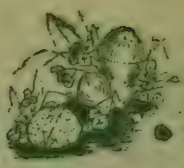

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HOME OF THE BLACK FLY.

PHOTO BY E. J. BURNHAM

NATURE STUDY.

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VOL. IV. October, 1903. No. 5.

The Home of the Black-Fly.

BY EDWARD J. BURNHAM.

There is a brook, a brisk hour's walk away from my home, which I have visited often, summer and winter, spring and fall, for four years or more, that I might come to know the creatures that live in it and learn their ways. It begins with tiny rivulets, which meet in one of the smallest of ponds, that is half marsh, and just large enough for two or three families of muskrats to build their winter houses in, which they do every year.

From this boggy pond, which is little more than a pool, it flows on through woodland, growing bigger and stronger, until it reaches a level, open space, that the early settlers called a "beaver meadow," because long ago the beavers lived here in a pond of their own making. The last trace of the dam that the beavers built has disappeared, but one may still see the narrowed passage between two banks, where it must have been. The brook flows slowly in a winding course through this meadow, as if thinking of the past and wondering where the beavers are, and then

tumbles over rocks through the woods, pausing to rest now and then in a deep, dark pool, until it comes out into the open country through a big stone culvert under a highway, where the picture was taken, and hurries on through pasture and meadow, slowing up at last in the lowlands, a big brook now, finding its way leisurely to a lake.

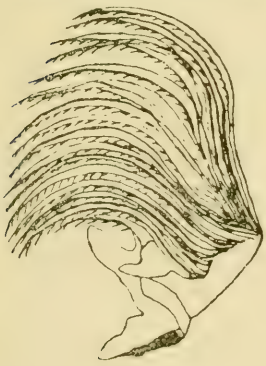
Though flowing throughout its course within a few miles of a city, and fished almost constantly, there are trout in it, and probably always will be so long as its water is left clear and pure, for there is a wonderful supply of food, and the trout, having plenty to eat, seldom take the hook greedily. There are always a few big ones in the deep holes near the lake, but they can be caught only with patience and skill. If you bait a hook with a tempting cluster of angleworms, set your fishing-rod firmly in the ground at an angle, so that the baited hook will nearly touch the bottom of a deep hole, and then creep noiselessly to the bank, remaining very still and peering through the grass and bushes, you will sometimes see a big trout move lazily out to the bait, swim slowly around it, and even give it a contemptuous snap with his tail. Farther up, among the rapids, the smaller trout are more active, but when one is taken, its stomach is almost always full, and no wonder, for the trout are comparatively few and the brook well stocked with food.

The stones in the rapids are covered with brook-weed, and in the weed are countless creatures, feeding on one another and finally making the best of food for fishes. Snails are so numerous that I have counted 312—very small, of course—in a single handful. The larva of the horse-fly, an ugly looking creature, lives in the water, feeds on these snails, grows big and plump, and not infrequently ends its career in the stomach of a fish. Here, too, among the rocks and in the brook-weed, is the larva of the big crane-fly, or daddy-long-legs, which also lives in

the water, and grows to be a big, clumsy, rolling, crawling creature, more than an inch long and nearly as big round as a lead pencil.

Under the stones are the sprawling nymphs of the stone-flies, which seem never to be doing anything or to have anything to do; while in the brook-weed are countless larvæ of the caddis-flies—some in cylindrical stone cases that can be moved about; some in little houses made of grains of sand, fastened together and to a stone with silk; some in tubes of silk and sand, with a net of silk near the mouth, which serves as a trap to catch whatever the swiftly running water may bring along.

There are many other kinds of insects and small water creatures crowding and fighting and eating one another in these rapids, but the most numerous of all are the larvæ of the black-flies. The black-fly is so abundant here that it drives the fisherman out of the woods, torments the cattle in the pasture, and pesters the farmer in the field. After making a nuisance of itself, it lays hundreds of eggs at the edge of the brook, just where the ripples wash back and forth upon a rock. Many a time, when watching the black-flies depositing their eggs, I have seen a big crane-fly bobbing up and down, touching the tip of its abdomen in the water. It was laying eggs, too, for it was a wise old crane-fly, and knew that by the time its eggs were hatched there would be plenty of black-fly larvæ for the larvæ of the crane-fly to feed upon.



THE FAN.

Millions on millions of these tiny black-fly larvæ hatch from the countless eggs, crowd upon the stones in the rap-

ids until every bit of available surface is covered by them, spread their little "fans," and begin to take in food and to grow.

The black-fly, or Simulium, larva, which will be scarcely more than a quarter of an inch long when grown, is almost microscopic in the beginning, but it is fully equipped at the outset for catching and eating, and the particles of food which it catches are ever so much smaller than itself. For it feeds upon diatoms, which can only be seen with the help of a powerful microscope, and which are brought along in the swiftly running water from the more quiet places in the brook above.

The larva has a row of tiny hooks, arranged in the form of a ring, at the lower end of its body, with which it can hold on to a weed-covered or slimy stone, even when the water is running very fast. When its hooks are fairly set, it rises upright, looking like a tiny mealbag with the upper end a little the smaller, and spreads out its fans, one on either side of its head, to catch the diatoms that it feeds upon. I have found sixteen species, or kinds, of diatoms in a single stomach, while the total number of individuals was so great that it was a hopeless task to try to count them. The cut, showing a fan, enlarged many hundred times, gives a better idea of this wonderful little strainer than any description could do.

Of course only a small part of the great number of these larvæ live to grow up and become black-flies. Some lose their hold, many are crowded off, some are swept away by the water, and in the end most of them have been carried into the nets of the caddis-flies, or have fallen into the jaws of the many hungry things that are waiting for them.

A September Ramble.

BY MARY HAZEN ARNOLD.

If a walk through the woods on a bleak *March* day, discloses manifold treasures, what words can do justice to the delights of a *September* ramble, when we absorb supplies of sunshine and vigor 'gainst the coming wintry days? The charm of it all is too illusive to put on paper.

> "What is so rare as a day in—*September*—
> Then, if ever, come perfect days,
> Days whose charm we long shall remember,
> Visions of beauty wherever we stray."

These woodland notes give nothing of scientific knowledge, but may bring at least a suggestion of the magnetic influences from the beautiful outdoor world. As we climb the hill through the wood, ruthlessly crushing beneath our feet the rich green carpet of bear's grass, the bluejays scream to us—Stay! Stay! Stay! And we fain would heed their call; dainty, black-capped sprites gather about us with "Chickadee, dee, dee, We're glad to see thee, thee." Cheery little fellows, they must be the Mrs. Wiggs of the Bird Patch.

The wood path overflows with treasures; here a lacy Botrychium dissectum spreads out its hand of lace, the prince's pine with varnished leaf, the rattlesnake plantain with delicate silvery veins, and rattleboxes for the children.

Brer Rabbit plays peek-a-boo from a thicket; he sees no gun, but has learned to put no trust in man, so turns tail—shows the white feather—and seeks safe quarters in a hole beneath a convenient rock. Master Chipmunk gives us greeting from the wall where the bitter sweet with its bright clusters of fruit runs riot.

Next we pass an immense anthill, whose inmates scurry back and forth in dire confusion, lest one of those great

feet should trample on their dug-out. Now the trailing Christmas-greens set snares for our unwary feet; here in the fence corner is a cluster of horse-gentian with four orange globes at intervals up the stalk in the axils of the coarse leaves.

Now, crossing the meadow, carpeted with bloom of clover, black eyed Susans, and maiden's tresses, we pause on the brow of the hill, and view the landscape o'er. A beautiful panorama opens before us, the city nestles in the valley, midst a setting of green hills which rise about it for miles and miles in great circles, and over all smiles the bluest of blue skies, where a black crow wheels backward and forward in fierce persuit of a hawk.

Here we seat ourselves upon the greensward, for "a feast of reason, and a flow of soul," and incidentally, to refresh the inner man with the fruits of the land—which flows—not with milk and honey, (tho' we hear the tinkle of a cow-bell and the hum of bees), but chestnuts, a walnut or two, fresh huckleberries, sweet turnips purloined from a near by field, choke-cherries from the hedge, and some hard apples, seem ambrosia from the gods when eaten midst such surroundings.

Again we take up our journey; by a babbling brook, past seamy boulders, where written in stone are records of the past that he who runs may read; down into a grassy cart-path lined on either hand with masses of beautiful feathery starred asters: the sweet fern, already budded with the promise of another year's fruit fills the air with fragrance, and on either side the lion's paw swings nodding blossoms. Hark! Listen to the sweet murmuring melody from the tangle. It is a song sparrow whispering to its mate. Everywhere the dainty gerardia hangs its modest cups, and the loosestrife lifts its pretty whorled leaves.

Such a study in color delights the eye in every direction. The purpling poke-berries, the crimsoning dogwood, gold-

en-rod, which has captured the sunshine's rays, soft browns of ripened cinnamon ferns and bracken, maples already robing themselves in warm red autumnal raiment, the glossy, deep-cut leaves of the yellow oak, quivering white birches, bright berries of sarsaparilla and Indian turnip.

But here in the woods, miles from home, we must stop ; our limits of time and space are over passed. Although hardly an entrance has been made into the treasure-house of field and forest.

Training an Elephant.

The training of an elephant is pretty much like the training of any other animal, human or otherwise. And the training of any animal depends almost wholly on the fact how well you can make it understand that you are the boss, and that as compared to yourself it isn't a flyspeck in the universe. You have got to make the brute understand several things very clearly. In the first place, that you are the master of pain—that, if you like, you can make life so unbearable for it that it would do anything rather than to annoy you or to disobey. In the second place, the animal is to understand that when it does what is expected, you are the master of its comfort and happiness, just as well as the author of its misery.

In the third place, the brute must be made to understand that no ugliness will be overlooked without due punishment and that you are no more afraid of it than you would be of the straw under its feet.

The time required to tame an elephant varies from a week to three weeks or a month. To begin with, only one man is detailed to each elephant. First of all, the beast must get used to the sight of a man. Like human creatures, the best way to reach this stage of the taming is through the stomach. Day for day, as the animal gets hungry, the same man comes to appease his wants.

When the time comes that man and animal are pretty well aquainted, the trainer, armed with an elephant hook, enters the cage to throw some of the chains off the beast. You will notice in the first place the animal has discovered that no harm will come to him and that the strange creature means only well. Now this

same little person, not more than one-thirtieth or one-fortieth the weight of the big fellow, enters the stall and throws off the chains that bound him like a helpless baby. By that the animal gets a distorted idea of the power of the man. He feels that what he could not do the little creature has done.

If the elephant is a particularly treacherous brute the chances are he will break out right here. The instant the big head is freed from the martingale to which it was attached by iron chains running from the tusks between the forelegs, the trunk may be up to mischief, and then comes lesson three. The animal must be taught that if the friendly and harmless creature only will, he can produce sensations that will make a goose skin creep over the thick hide. There is only one way of teaching an elephant a lesson while you are at it, and that is to give it to him unmercifully, driving the hook into the fat side, or anywhere else, and clawing six inches of hole into the flesh. To do less than to bring a squeal out of the fellow at this stage of the game would mean to forfeit all mastery.

And now the tamed elephant is brought in as a taskmaster. Within sight of the raw fellow the tame one picks up his keeper, sets him on his neck and walks back and forth in sight of the astounded stranger, being guided by the gentle prod of the hook. And if you ever doubted there was a language between animals, then, as a rule, comes an exhibition that will convince you otherwise. The animal is let loose in a corral along with tamed pachyderms, and the animal language begins. Tamer the new fellow becomes, until, after seeing the example of the trained brethren, he takes up his keeper at a word of command and sets him on the massive neck. From then on the animal is tamed.—*New York Evening Post.*

A Milwaukee woman who has been interested in keeping a number of robins and other birds in an aviary at her home, is preparing to release them for the winter. She finds, however, that the feathered pets are not anxious to leave the place where they get free board and a nice cozy home to nest in. Those which have been released hang about the premises and want to get back into the aviary. She has invited the teachers and pupils of the schools near her home to visit the aviary, and learn the ways of the birds.—*Milwaukee Evening Wisconsin.*

If thou toilest and lovest, O Insect, whatever may be thy aspect, I cannot separate myself from thee. We are truly somewhat akin. For what am I myself, but a worker? What has been my greatest happiness in this world?—*Michelet.*

Ages of Birds.

Among birds the swan lives to be the oldest, in extreme cases reaching 300 years. The falcon has been known to live 162 years. An eagle died in 1819 which had been caught 104 years before and was then quite old. A white headed vulture, which was caught in 1706, died in the aviary at Schonbrun, near Vienna, in 1824. Parrots live more than a century. Water birds have a long life, exceeding that of several generations of men. Ravens also live over a hundred years.

In captivity, magpies live from twenty to twenty-five years, and still longer in freedom. The common hen attains the age of from fifteen to twenty years. Doves live ten years and the little singing birds from eight to seventeen years. The nightingale's life is the shortest, ten years being the longest, and next comes the blackbird, which never lives longer than fifteen years.—*Wilmington, N. C., Star.*

A Bird's Queer Death Song.

There is a queer bird in the jungles of northern South America which is called the "pauji" by the natives, but is known to science as the galeated curasson. It is chiefly remarkable because it sings its own death song.

It does not really sing, but makes a deep humming noise, which sounds very much like the Spanish words "El muerto esta aqui"—"The corpse lies here."

"It is while uttering this lugubrious chant," said a South American traveler, "that the 'pauji' usually meets its death, for the hunter can easily track it to its retreat, and it falls a victim, as the Indians say, to its own death song."

If the "pauji" gets suspicious, it immediately ceases humming and that is a sure indication to the hunter that the bird has seen him, or scents danger. In such a case, the only thing for the sportsman to do is to remain perfectly still. The bird may become reassured after waiting a while, and again begin to call, "The corpse lies here." It can then be cautiously approached and killed.

If it is only wounded, the "pauji" usually escapes, though it cannot fly much better than the ordinary domestic fowl. It is very fleet of foot, and will outrun the hunter until it is lost in the dense undergrowth of the jungle.

In the mating season, the male "pauji" is the most pugnacious of birds, and will fight its own kind whenever it meets them. Often the fight ends in the annihilation of both combatants.— *Toronto, Canada, Mail and Empire.*

The Song Sparrow.

Sweetest of the early minstrels of spring, most varied and most musically industrious is the song sparrow. It is to be found in the city parks by those who know how and where to look for it, though naturally it is an inhabitant of the fields and the open spaces of woods. This is an inconsiderable bird, about the height and length of the English sparrow, but slenderer and without the bullet, pugnacious John Bull head. It is brown of back, wings and head, like the English sparrow, but it is to be identified readily by the speckled breast, which has a single black spot low down in the center.

The song sparrow is seldom seen upon trees and very rarely high up. It perches generally upon the ground or upon some low bush or dead tree top. When disturbed it dives instantly into low brush or other thick cover, flirting its tail as it goes, and once there, sets up immediately a faint cheep-cheep of alarm. It has every confidence in its ability to hide, however, and if it thinks itself securely concealed will often sing when the listener is standing within a yard. For vocal excercise the bird prefers a stump or the limb of a sapling not more than ten feet from the ground. If the sun be shining full upon it so much the better. On dark, damp days it is almost wholly silent.

A suitable perch being found, it will sit for half an hour at a stretch and go through its repertory. This is one of the most extensive of all the wild songsters. It is surpassed only by some members of the thrush family, and not by all of them. It has many notes, and these notes are broken into several arrangements, which are never mixed and never varied, just as if a minstrel sparrow wrote a lot of songs ages ago and a censor sparrow selected those which were fit for public hearing, excluding all of the rest by the simple process of destroying the manuscript and killing the composer. If let alone the singer will sing everything that it knows, and then if not satisfied will sing them over again, being in this respect much like a vaudeville artist, willing to do an unremitted number of turns so long as there is a handicap and the management does not interfere. Each song consists of half a dozen notes and half notes, beginning with a faint peep or wavo and ending with a joyous trill, as if the performer were so happy because of its skill that it could not help showing it.—*New York Sun.*

How Birds Got Their Plumage.

The red Indians say that originally all the birds were without feathers. And they did not like it. So they held a great council and resolved they must have some kind of clothes to wear.

They were told that coverings had been prepared for them, but that they were a long way off and they must either go or send for them.

It was proposed that the crow go to get the clothing, but he excused himself by saying that he must stay and take care of his family.

Then the eagle was asked to undertake the journey, but he said that the hunters would surely shoot him on the way. So one after another all the birds begged off until it came to the turkey buzzard, who volunteered to undertake the task.

The place where the feathery coverings were, was such a long way off that the turkey buzzard, who had been very particular about his food before, was obliged to eat carrion and all sorts of things to keep alive, which accounts for his present habits of diet. However, he reached the place where the feather clothes were and selected for himself the most beautiful suit of plumage in the lot.

But he found that with this on he could not fly, and so he continued trying on the different suits of feathers until he came to the

one he now wears. In this one he found that he could fly swiftly and gracefully, though it was the least beautiful of all, so he took it for his own.

Then, gathering up the other suits, he flew back to where the naked birds were waiting for him, and each selected the suit which he wears to this day.—*Cincinnati, Ohio, Commercial Tribune.*

Tommy.

BY WILLIAM H. HUSE.

Tommy is a turtle. If a scientist were to name him he would call him *Chelydra serpentina* ; that is too long a name however, for family use, and so we call him by the shorter name. The species is naturally savage, but Tommy was so young when caught that he has lost all the ferocity that he may have inherited from his ancestors and never shows the slightest disposition to bite except when he is hungry. He has been in captivity now for three years and is hale and hearty. The length of the shell at present is about three inches. The entire length including neck and tail is nearly eight. A year ago Tommy's weight was three and a half ounces. In the year that has passed he has gained nearly an ounce, and that with all he has wanted to eat. This slow progress is not surprising, for like all reptiles, turtles live slowly, breathe slowly and grow slowly. It will be a long time before Tommy is too large to keep as a pet.

Like the musk turtle the snapping turtle remains in the water nearly all the time, more than do some of our other species, and so can be kept in an aquarium without the necessity of a promenade so often as to make it a burden to wait upon him. Tommy stays in the water most of the time eating worms or meat according to the *menu* and has no enemies to disturb his peace of mind. While he has not as yet manifested affection towards any of his many

friends, he shows decided pleasure at having the back of his head scratched. He is an interesting little fellow and may be heard from again.

Nature Study Lessons. XVII.

BY EDWARD J. BURNHAM.

The Click-beetles are so common, and their power of snapping themselves into the air, when placed on their backs, is so peculiar, that almost all country boys and many city boys will recognize them at once in the insect box. In shape, too, as well as in habits, they have a marked family resemblance, although they differ much in color and size. Some are brown, while others are black, and some are so small they can scarcely be seen, while others, like the big Eyed Elater, are more than an inch long; but all have a pointed spine underneath, the end of which fits into a cavity behind, and which serves as a spring when the beetle wants to snap itself into the air and turn over on to its feet as it comes down again.

The Elaters, or Click-beetles, are trim, tidy-looking insects, and no one, to see them, would suspect that they have changed from the hard, round, yellow or white wire-worms that are to be found in rotting wood, in the stems of some plants, and in the ground, where they often do great injury to growing crops—indeed, sometimes eating the seed before the crop begins to grow.

The Eyed Elater is a prize for any one's collection, and yet it is not so rare that a boy or girl need despair of finding it. The larvæ, or grubs, are frequently found in the trunks of old apple-trees, so that an orchard, of course, and especially an old one, is a good place to look for this great pepper-and-salt-colored fellow, with the two large, black velvety eye-like spots that appear to be on its head, but are

really on the part known as the prothorax. This prothorax, in any insect, can always be distinguished from the head by the fact that the first pair of legs are attached to it, and of course there could be no legs on the head. The big spots, looking like staring eyes, probably serve to frighten the Eyed Elater's enemies away. It even looks alarming to children and grown folks, until one learns what a gentle, harmless creature it is, with a trick of playing that it is dead, and then snapping itself into the air, alighting on its feet and running away.

When the Click-beetles, large and small, have been pinned in a row or box by themselves, and labelled with the family name, Elateridæ, there will probably be found some other beetles of about the same shape, but with metallic colors, looking as if they were made of bronze. They are hard, too, as if made of metal and their wing-covers are rough and furrowed. They have a spine or "process" extending backward from between the front legs, as the Click-beetles; but they cannot spring up like them when left upon their backs. These hard, metal-colored beetles are the Metallic Wood-borers. The larvæ, or young, of these beetles are the "flat-headed" worms, of which one kind, or species, is found in apple-trees, another in pine, another in peach, cherry, beech, maple, and so on. These Metallic Wood-borers belong to the family Buprestidæ, and are often spoken of as Buprestids.

Another family of beetles whose larvæ live in the wood or pith of trees is composed of the Long-horns. Perhaps the children have been so fortunate as to have in their collection a beautiful brown and gray beetle, with antennæ, or "feelers," twice as long as the body, which is itself an inch and a quarter in length. This is the Sawyer-beetle, and its larva lives in the solid wood of pine and fir. Another beetle of the same family is the Cloaked Knotty-horn, often found in large numbers on elder in June and July.

It is a dark-blue beetle, with green reflections, and with the base of the wing-covers orange-yellow, giving it the appearance of wearing a cloak over its shoulders. Other beautiful beetles of this family, whose members are known as the Cerambycidæ, are the Maple-borer, the Locust-borer and the Painted Hickory-borer. They are beautifully marked with black and yellow, and add greatly to the appearance of any collection.

There are more than seventy families of beetles in North America, and the recital of their names alone would be wearisome to the children. It would also be wholly profitless. It is much better worth while to learn to observe the peculiarities of a few insects than to try to remember the names of a great many. Children should be helped to compare the beetles in their collections, observing that some have smooth wing-covers, while in others the wing-covers are roughened, pitted, furrowed, spotted, banded, curved or flat; that in some beetles they are shorter than the body, while in others they cover it for the entire length. They should examine the antennæ, the feet and the mouth-parts, trying to find in what respects the members of a family agree among themselves, and in what they differ from other families. Any manual of entomology will explain the terms used to describe the parts and characters of insects, and it is surprising how readily children catch them up and apply them—at least when they are not set to do the work as a task. One who has never tried it can have no idea of the zest and enjoyment with which even the very young, when enthusiastically guided, will hunt for the "scrobe" at the base of the mandibles, the "setigeous puncture" above the eye, and a "tuberosity" on a wing-cover. It is the best of training for the children, and it does good like a medicine—far beyond the skill of the physician—to the grown-ups. It will help to keep away the wrinkles and loosen somewhat the fibers which all too

soon begin to show a tendency to tighten around the heart.

In our next lesson we will learn something about the families of beetles that live in the streams and ponds, and then we must put away beetles, or Coleoptera, for the present, and take up the bugs, or Hemiptera, for, unless we are diligent, we shall scarcely have finished with our seven boxes when spring and the insects have come again.

How Animals Sleep.

The writer, who received permission to visit the Central Park zoo late at night, in order to note the different positions in which animals and birds rest, observed some curious things. To anyone fond of natural history, such a visit is most interesting. In the lion-house the lioness was lying on her left side at full length, while the lion, couchant, rested his head on his crossed forepaws, his hindlegs being half drawn under him, and the tail curled in toward the body

The pumas, tigers and leopards were all resting on their sides, in nearly every case lying on the right side. The hyenas—pariahs and scavengers of the forest—rested with their hindlegs drawn under them, the forelegs stretched out, with heads slightly bent to the right. Nearby the two-horned rhinoceros was lying at full length on his left side, gently snoring. The hippopotami showed only their heads and backs above the water.

No longer looking for peanuts, the elephants lay stretched out on the floor, their huge legs lying out at full length and the trunk curved under the body. They were all resting on their right side. Close by, in the deer-house, the different deer had all crouched low for their rest, with forelegs bent under them and the hind ones drawn up, while

the head was turned to the right and rested on the side of the body.

The oryx, with its long horns, was resting with its head away from the body, the horns making an arch over the shoulders. The alpaca simply looked like a large ball of black wool. The camels lay on their stomachs with their fore and hindlegs bent under them, while their heads and necks were stretched straight out.

The monkeys were squatting about their cages, their heads bowed down over their chests, the arms resting on the thighs of the hind ones. A baby monkey was sleeping, cuddled up in the arms of its mother, its little eyes peering out inquisitively at the midnight visitors. In the smaller animal-house, given up almost entirely to civet-cats, 'possums and such like, every animal had curled itself up into the smallest possible space, burying the nose under the stomach, with all the paws drawn up close to the body. The bears were resting in various positions, some lying out at full length, others curled up. The two polar bears were huddled up in a heap, with their noses buried deep in their white fur, and the forepaws crossed over the eyes. The llamas, zebus and American buffalos were resting as cows rest, with their forelegs drawn under them and their hind ones drawn in. The porcupine was lying on its stomach, its head bent to the left, with the quills standing out in every direction. The emu was resting with the first joints of its legs on the ground, the body a short distance above and its head buried in the plumes.

Most of the birds were resting on their perches, their legs bent under them and their heads tucked under a wing—in every case the right one. The parrots had only drawn their necks in, while the pelicans slept squatting on the ground, their heads drawn well back and their ponderous bills resting on their breasts.—*Forest and Stream.*

Plant Hunting.

To me, no part of my longed-for vacation is so pleasant as the opportunities afforded to make new and renew old acquaintances among the flowers of the woods, the field and the lakeside. The very first sight of the red-flowering raspberry from the car window, before the actual climb to Eagle's Mere is begun, causes a shout of joy; and as the little narrow-gauge road winds in its upward climb among ferns and along the tumbling brook, memory prompts a watch for the wild bergamot that rivals in brilliance the cardinal flower I have seen along Muncy Creek. And then the rhododendrons along the lakeside—with what pleasure we find that here on the mountain top these regal flowers have waited for us until late July! I cannot resist the drawings of the camera, and although I have loudly declaimed against those who cut a single twig from these rare old plants hanging over the water's edge, I cautiously snip a half-dozen bloom heads, and flee to the place where my lens may look at them. On the way there appears one in authority, who, pointing the finger of reproach, calls to mind my fulminations against the vandals who ruthlessly cut and slash. My beneficent purpose satisfies him, however, and I photograph in peace.

One day there comes a trip along a lovely fern-bordered road, four or five miles down the mountain. By a roadside spring we stop all the family to drink the water and to get closer to a great bank of billowy ferns, worth a dozen greenhouses full of tender and pampered winter pets! It is on the way home that I first realize what a dainty little white bell precedes the aromatic red berries of the familiar wintergreen, and find close by a few belated flowers, just as dainty and most remarkably sweet, of the partridge vine or Mitchella, with its scarlet fruits of last year close by and mingling with the fresh green berries of the season. Another delicate white blossom peeps out from the green moss, holding its fine flowers above the round leaves. A careful look, and it proves to be an additional new acquaintance—the dalibarda, without a common name.

The Eagle's Mere woods show here and there a pair of shining flat leaves, prone on the ground; and these I am told are the great habenaria, of which I may find a bloom—perhaps! Sure enough, one day I do find a great upshooting spike, crowned with odd greenish white flowers. A rush is made for the camera and, with tedious care, an "exposure" follows. Alas! when I develop, I

find that in my excitement I have tried to get "all outdoors" on my plate, for also on the same piece of glass I have previously exposed a landscape, but "the other way up," resulting in a grotesque disappointment.—*J. H. McFarland, Country Life in America.*

Mesmerizing Birds.

Dr. William Beebe, curator of the Bronx Zoological Garden, has been mesmerizing birds with considerable success. He appealed to the bird's minds through his own and brought them under his influence by looking at them steadily. He says that to do it he had to force his own mentality down nearer the level of the birds, because his mind worked against them and obtruded so much that his patients became terrified. This process he called "partly mesmerizing himself." In that condition he was able to force an idea, a wish to do something which he orders, upon the birds, thus proving that at least mental telepathy was possible between bird and man.

Birds, Dr. Beebe discovered, differ in a remarkable degree in the susceptibility to suggestion. For instance, a catbird, after a half hour's effort to bring it under control, refused to give in, while a large saw-whet owl became sleepy after an effort of five minutes. He became so drowsy that he could hardly keep his place on the perch, so unsteady did he become.

An English sparrow was entirely unmanageable, but a white-throated sparrow came under the influence at once. When the birds awakened the after effects were noteworthy. Although apparently as wide awake and active as before, they were remarkably tame and did not fly away when he thrust his fingers at them. If he took them into his hand they pecked a little fretfully, and when released perched upon the cage and proceeded to arrange their plumage. Before they were hypnotized they would never have allowed such familiarity and would have been thrown into a spasm of fright at the first advance. They would not notice their companions in their cage, but followed their master about, coming close to the wire of the cage, as if they loved him.

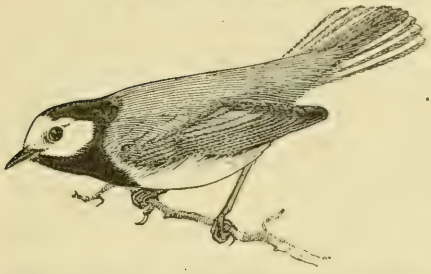
The doctor claims that they are susceptible to the influence because birds have highly developed intellectual and emotional character. In the first place, birds have remarkable memories. A pigeon is said to have remembered a person after months, and a bul-

finch knew its master's voice after a year's absence. Birds, too, dream and chirp in their sleep. All birds show the possession of love and sympathy. They frequently mate for life. A bird mother's affection for her young is so strong that she will give her life defending theirs.—*New York Herald.*

Birds That are Gone.

We were recently asked by a lady friend what had become of the night hawks and whippoorwills which used to be such common birds all through the western country. Some way our attention had not been called to the almost entire disappearance of these birds until this question was asked, but it is only too true that they are gone, and probably gone for good. Possibly the destruction of the woods may account for the disappearance of the whippoorwill, whose quaint and almost ghostly call used to break the profound and solemn stillness of the midsummer evening—a call closely associated with the chir-r of the tree toad, the flashes from a low lying and distant thundercloud and the fragrance of June roses held captive by the humidity of a June night. In common with its near relative, the night hawk, its habits but ill fitted it to survive contact with man's benevolent civilization—his merciless small boy, his prowling cats, his barbaric partner, who would have unfeelingly worn a wing from Noah's dove were but such the fashion—or possibly these birds, even if in no manner molested by man, have, in common with other types of wild life, migrated to sections of the country where neither man nor his work has marred the fair face of nature.—*Chicago Bulletin.*

The Warblers in Color.



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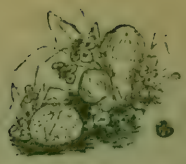

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NATURE STUDY.

PUBLISHED UNDER THE AUSPICES OF THE

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VOL. IV. November, 1903. No. 6.

Wearing Away the Continent.

BY WILLIAM H. HUSE.

Ever since the mountains were raised above the sea they have been moving back; from the day the continents were made they have been coasting away to form new continents on the ocean bottom. The elements work continually; nature is never still. The work of ocean waves is everlasting and the observer is never weary. To watch the breakers dash without ceasing against the shore is to see one of the best symbols of eternity. Their work is slow, but time is long, and the task is accomplished at last. The ledge gives way in time.

In the September NATURE STUDY, the frontispiece well represented erosion, by the breaking away of blocks, made by the joints in the ledge. Our illustration this month shows a ledge worn away by the grinding of the bowlders dashed up by storm waves. The scene is situated on the end of Cape Neddick in York, Me. and is one of the many attractions of that popular resort. The ledge is granite of a peculiar composition, more easily weathered and decom-

posed than most varieties of that rock. Here the elements find few joints in which to get a foothold for work. The erosion is by decomposition and grinding. The bowlders are mostly too large to be moved by anything less than storm waves, but these lift even the largest and dash them against the face of the ledge and gradually grind it away. The illustration can hardly show the concavity that is so plainly seen in the rock itself. It is a fine example of the grinding power of the storm waves armed with bowlders.

What is shown here may be seen wherever the continental rocks and ocean meet. The softer element overcomes the harder, and in the end the land disappears, unless uplifting goes on with the erosion.

Another Nest That Failed.

BY ALICE BLAKE CURRIER.

Perhaps it ought not to be set down at the very outset as a decided failure, for although no happy nestlings were reared to enjoy life, still it served to impress on our minds a different feature of bird life from any we had hitherto observed.

Early in June, while making preparations for a jaunt into the country, I noticed that a robin was also busily engaged in an adjoining maple, flying back and forth with material for a nest, and surely enough, by a little friendly espionage, I succeeded in learning that the foundation was already laid for a future home.

I thought nothing more of this event until we had returned, and happening to recall my new bird neighbor, yes, there she was, brooding on the nest, now long since completed.

Well, very cold rains followed and this poor nest, evidently fashioned by a young and inexperienced couple of

house builders in the small maple, exposed as it was on the north, east, and west, was pretty well flooded, and what was more in evidence was that this mother bird seemed to be unattended.

No happy, expectant mate was at hand, ever with a dainty morsel or dangling worm.

What could this mean?

Was the other parent away or was he a deserter, a trait which I had never known the robin to possess. After a time, by considerable peering and craning of neck, I discovered during the mother's short absence, that five greenish-blue eggs reposed within that nest, but her flights were few and far between. I began to be very much interested in my neighbor's affairs, who always sat so patiently upon that nest, watching and looking anxiously about.

I think she never quite knew just what had happened to her mate. But I imagine that I do, still I can only conjecture from two little circumstances.

One afternoon, about this time, after the dismissal of school, down the street came a group of happy boys and girls and as they passed, I noticed by their noisy laughter something unusual had happened. Looking out, I discovered that one of the boys was teasing the girls, as boys will sometimes do, and in his hands was a dead robin redbreast, with which he was frightening them.

Also, at this time, we missed the singing of one whose notes were more thrush-like and whom we had admired as an unusually fine singer for a robin.

By what means our neighbor had come to so untimely an end, I can only leave you to imagine, but had he fallen a prey to one of the many cats, I think he would have been devoured and not been found upon the lawn.

From that time on, my sympathy for that lone bird upon the nest was greatly increased. How was she to provide

for herself and brood over those eggs, to say nothing of feeding and caring for the hungry nestlings?

But let me say right here, that that was another case of counting the chickens before they were hatched. Perhaps you think I might end this tale by telling that none of those eggs were ever hatched, but I also wish to state what proved to be, to me, the most interesting feature of this case. As I told you before, this drenching downpour of rain, accompanied by heavy, northeast gales, lasted several days, and all one day I could scarcely make out through the rain, that patient, water-soaked mother swaying in the wind upon that nest. I tried to tempt her off, by throwing bread-crumbs and a luscious strawberry or two from the window, but I never saw her leave the nest, although I watched until dusk, and the food only served to fill and encourage a horde of English sparrows, who, thinking it a sort of continuous performance, lined up on the wires in front of the windows, awaiting my next appearance.

When the rain finally ceased, I tempted her to the lawn to pick up the food I threw, and sometimes, for short intervals, she would venture a little farther up the road, to get a good, fat, juicy earth worm perhaps, but only for a very brief respite, and back she would be upon the nest. From time to time she would change the position of the eggs, and also take a different posture herself.

One morning, upon awakening, I looked on the nest, as had now become so habitual, and could I believe my eyes? There was another robin, with a long worm in its bill, beside that nest. Had I after all been so much mistaken and had the parent been near by all the time? But no, upon a closer inspection, I saw from the coloring that this was another female robin.

My bird, as I will now call her, gratefully swallowed the worm and the other bird flew away up the street. Several

times that bird came there, at least, I called it the same one, and she too had a brood of fledgelings that she was just bringing to the lawn in search of food. But she had a proud mate assisting in the task of filling those capacious, yellow mouths, and in some way either had observed that her lone neighbor was having a hard struggle to exist alone, or possibly someone might have told her. Who knows?

Early one morning I saw this kindhearted neighbor leave her brood, who were fast becoming competent to care for themselves, upon the lawn beneath the window and fly to the nest in the maple tree and exchange places with the stiff and weary mother-bird, while my bird flew down to the grass with the young ones. I had already thrown out crumbs before this occurred, and among them was a succulent strawberry, which I had intended for my bird's breakfast. But one of those saucy youngsters made a dive for it and she, knowing I had meant it for her delectation, naturally objected and scolded the upstart in no uncertain tones. This was too much for the neighbor on the nest, and she indignantly flounced down to take her offspring's part and after a vehement and noisy protest (no doubt thinking she had been mistreated) flew away with her flock. My bird resumed her place upon the nest after finishing her repast and I never saw the other bird come again to the tree.

One day I found a broken egg beneath the tree and soon after the nest was deserted. I knew my bird by her bedraggled, faded appearance, and she often came afterward and perched upon the edge of the nest, looking long and thoughtfully at those eggs. I am loath to add anything to detract from the character of such an unselfish, patient mother, still I almost suspect that she soon recovered from her grief and disappointment, for afterwards I saw her several times coquetting with another robin upon the lawn,

but whether she did mate again, I do not know. At last accounts, those beautiful blue eggs still reposed in their dismantled, and swaying nest.

Sea Flowers as Pets.

The queerest pets in the world are kept in a beautiful row of clear, flashing, round glass tanks on an upper floor of a large aquarium. As you approach the tanks you behold glowing little groups of color and artistic blending and mingling of fantastic weeds and shining stones. Then when you peer into the tanks you see what at first seem to you just like particularly handsome and gorgeous flowers growing all over the little rockeries. Some of the flowers look like dainty pink and white and yellow and purple and crimson dahlias. Others look almost like daisies, with lacelike petals. Others look like little star flowers, all pure white and perfect. These flowers are of all sizes, from tiny ones barely large enough to see, to great ones almost large enough to fill a saucer.

But if you will watch these "flowers" for a few minutes you will jump suddenly, for all at once you will see one move its petals. Then you will see another and another do it. Slowly the petals unfold or contract, with little jerking movements, sometimes twining in the water like snakes.

Tap smartly on the table on which the tanks stand, and like lightning all the petals will have disappeared. These sea flowers are really not flowers at all. They are living creatures, known as sea anemones.

For many years a scientist has tended and fed them, and the little animated flowers actually have come to know him. When he feeds them, he puts a little bit of fish on the end of a long pointed stick and puts it carefully down into the water until it is near the anemone. It did not

take long for the beautiful things to understand it, and, whereas at first they used to withdraw their petals and shut up tightly when the stick approached, now they twine gracefully and stretch their dainty arms out as far as they can in order to reach it.—*London Answers.*

Bird That Tends Flock.

The natives of Venezuela and adjoining countries on the north side of the river Amazon, often avail themselves of the services of the native crane to care for their poultry, and also use it in the place of a collie or shepherd dog, to guard and herd their domestic animals. This remarkable bird, which the Indians call yakamik, is found in a wild state in the great forests that lie between the northern coasts of South America and the Amazon river, particularly in Venezuela and British Guiana. The birds never leave the forests unless shot or captured.

They travel about in flocks of from 100 to 200, in search of the berries, fruits, and insects upon which they subsist. Their usual gait is a slow and stately march, but they enliven themselves from time to time by leaping up in the air, executing eccentric and fancy waltzes, and striking the most absurd and preposterous attitudes. If pursued, they endeavor to save themselves by running, for their flight is so weak, according to Schomburg, that when they attempt to fly over a body of water of any considerable width, they are often compelled to drop upon it and save themselves by swimming.

When alarmed, they utter the peculiar cry which has obtained for them the name of trumpeters. The sound is something like that produced by a person endeavoring to shout the syllables "tow, tow, tow, tow, tow, tow," with his mouth shut, or the doleful noise made by children on New Year's day with their trumpets. The yakamiks usually deposit their eggs in a hollow in the ground, often at the foot of a tree.

A nest generally contains ten eggs of a pale green color. The young birds follow their mothers as soon as they are hatched, but do not lose their pretty downy covering until several weeks old. The yakamiks are very readily tamed and prove valuable servants to the Indians, who domesticate them, and as they are courageous,

and will protect animals intrusted to their care at every risk to themselves, even dogs are obliged to yield to their authority.

They may be trusted with the care of a flock of sheep or domestic fowls, and every morning will drive the ducks and poultry to their feeding places, and carefully collecting any stragglers, bring them safely home at night. A yakamik soon learns to know and obey the voice of his master, follows him, when permitted, wherever he goes, and appears delighted at receiving his caresses. It pines at his absence, and welcomes his return, and is extremely jealous of any rival. Should any animal attack its master, the yakamik in utmost fury attacks it with wings and beak, driving it away.

It presents itself regularly during meals, from which it chases all domestic animals, and even the negroes who wait on the table, if it is not well aquainted with them, and only asks for a share of the eatables after it has driven away all who might aspire to a favorable notice from the family.

Some Birds Seen at Martha's Vineyard.

BY A PINFEATHER ORNITHOLOGIST.

Martha's Vineyard is a sandy island lying three miles from the southern shore of Cape Cod. It is twenty-three miles long, by ten wide, and shows a very diversified surface. There are hills three to four hundred feet high, where the quail and upland plover are found. There is a perfectly level plain some five miles square which is covered with a low, impenetrable oak scrub. Here the heath hen and partridge live practically undisturbed. The field mouse and the locust thrive here, consequently the hawk and the chewink think these plains good feeding grounds, while the Maryland yellow-throat and the vesper sparrow call to one from every hand. Reedy marshes give nesting sites to the grackles and blackbirds. Deep woods shelter the oven-birds and other warblers, and give the jays a famous screaming ground. Long, shallow ponds attract the wading and diving birds, while rolling surf, and

stretches of sandy beach offer proper hospitality and fitting, to the sea birds of my list.

There are brooks and cranberry bogs which the catbird loves; bayberries by the acre for the myrtle warblers; grapes which happily escape the gathering hand of the "jell woman" and feed the robins instead; and pines which attract the crossbills even in July.

The island offers a sheltered wooded side on the northwestern border for the land birds. The South Shore, with its continuous row of fresh-water ponds separated by low sand dunes from the pounding ocean, offers rare attractions to the ducks, gulls, herons, sandpipers, etc.

Just here lies the difference between Martha's Vineyard and Nantucket, which is all sand dunes and scrub pines, or Martha's Vineyard and Baker's Island, or our own Shoals, which are all rock. The adjacent Gulf Stream tempers the climate and the sandy shoals which surround the island, make the water warmer than about the less favored islands of the North Shore. Topographically, then, Martha's Vineyard is favored from the ornithologist's point of view. The following is the list of birds seen during five seasons at Vineyard Haven, from April 1st to Oct. 25th. Consequently it is deficient in many water birds which frequent Vineyard Sound in winter. It contains only 107 species:

Holbœll's Grebe.
Horned "
Red-billed "
Loon.
Black-backed Gull.
Herring "
Ring-billed "
Laughing Tern.
Wilson's "
Arctic "
Least "
Greater Shearwater.
Gannet.
Red-breasted Merganser
Greater Yellow-legs.
Solitary Sandpiper.
Bartraman "
Spotted "
Black-bellied Plover.
Semipalmated "
Piping "
Quail.
Ruffed Grouse.
Heath Hen (*everywhere else extinct*).
Pheasant (introduced).
Sharp-shinned Hawk.
Marsh "

American Golden-eye Duck.
Black " "
White-winged Scoter.
American " "
Surf " "
Canada Goose.
American Bittern.
Great Blue Heron.
Black-crowned Night Heron.
Dowitcher.
Semipalmated Sandpiper.
Least " "
Sanderling.
Kingbird.
Great Crested Flycatcher.
Phœbe.
Wood Pewee.
Least " "
Blue Jay.
Crow.
Cowbird.
Red-winged Blackbird.
Meadow Lark.
Purple Grackle.
American Crossbill.
Goldfinch.
White-throated Sparrow.
Vesper " "
Savanna " "
Sharp-tailed " "
Chipping " "
Field " "
Song " "
Junco.
Chewink.
Indigo Bird.
Barn Swallow.
Tree " "
Bank " "
Cedar Bird.
Red-shouldered Hawk.
Broad-winged " "
Pigeon " "
Sparrow " "
Goshawk.
Bald Eagle.
American Osprey.
Yellow-billed Cuckoo.
Black " " "
Kingfisher.
Downy Woodpecker.
Flicker.
Chimney Swift.
Ruby-throated Humming-bird.
White Eyed Vireo.
Red Eyed " "
Black-throated Green Warbler.
Black and White " "
Chestnut sided " "
Nashville " "
Yellow " "
Parula " "
Myrtle " "
Plackpoll " "
Yellow Palm " "
Prairie " "
Pine " "
Oven Bird.
Maryland Yellow-throat.
American Redstart.
Catbird.
Brown Thrasher.
Brown Creeper.
White-breasted Nuthatch.
Red " " "
Chickadee.
Golden-crowned Kinglet.
Hermit Thrush.
Robin.
Bluebird.

Total 107 species.

The reader will note a lack of brightly colored land birds. I have never seen an oriole, a bobolink, a red-breasted grossbeak, or a tanager there. Though some of the brilliant warblers, like the redstart and the black-throated green, are numerous all summer.

Bluebirds are not common. Several sparrows which are often seen here I have never been able to write on my isl-

and list. They are the fox, tree, white-crowned and swamp sparrows. No purple martins, no veeries, nor thrushes of any kind, save the hermit, which, strange to say, nests there. No night hawks, nor hairy woodpeckers, no warbling, solitary, or yellow-throated vireos (and only one white-eyed) in all the five years' search. There is no extensive land bird migration, while the migratory movement of sea and beach birds is very pronounced, and exceedingly interesting. This October there was, however, an interesting migration of red-breasted nuthatches. Associated with flocks of pine-warblers and chickadees, they flew and chattered all about our little house in the pine woods. I could have collected fifty specimens a day had I been a marksman, or a butcher. This bird is erratic in his migrations. One either sees him in large flocks, or not at all. These may visit a locality for several seasons and then remain absent from it for as many more.

I noticed some, to me, new features in this bird this year, notably in his feeding habits. His manners at table are very different from those of his white-breasted cousin. Instead of running up and down the tree trunks head foremost, as the white-breasted bird does, the Canadian nuthatch hangs to a pine cone as a chickadee will, with his back to the ground. After extracting the seed he flies off with it to the horizontal branch of a neighboring tree, and perching on it as a sparrow would, enjoys his meal, often flying back to the same cone for more. He talks and chatters incessantly, saying "yuar, yuar, yuar, yuar," in many different keys, and as all the other nuthatches join in with him they make a noisy, merry chatter like so many mad, rollicking things who didn't care how much racket they made. The white-breasted nuthatch says "yank, yank," and I have never seen him anything but quiet and decorous. Though how he really feels inside when he gives his note which sounds like a distant flicker, I am not pre-

pared to say. I saw on October 4th a black and white warbler on a little eminence above the bayberry scrub, on the sea shore, hardly 30 feet away from the waves.

Mr. Brewster records in the Auk 1891, having seen red-breasted nuthatches and brown creepers feeding in the Autumn among the rocks on the barren points or islands on the sea coast. If these tree-trunk-loving birds could descend to the earth, and to so unusual a part of it, why should not my black and white warbler descend to the peak of a sandy, sea-blown pasture?

I noticed, *for the first time*, this year that all the black birds I know are walkers—the grackles, the red-winged black birds, the cow bird, the crow, the rusty black-birds. Certainly there is an anatomical reason for this, but to a casual observer and an ignorant one like myself, the fact aroused these questions. Does the garb funereal compel the gait decorous? Have these birds a color sense, and a knowledge of the eternal fitness of things? On the other hand, do gay feathers make gayer steps, or the consciousness of beautiful clothes a lighter foot?

An Outdoor Geography Lesson.

Through the western part of Manchester flows the Merrimack river. The rapids with the dam built by the Amoskeag Corporation furnish the water power that has made the city. Here a teacher took her class just beginning the study of land and water forms. They had learned the names, had seen the pictures and had made them as far as they could at the sand table. They only needed to see them out of doors to fix the facts in their minds. The river was visited. The water flowing over the dam illustrated falls; the rapids below were an object lesson; the eroded rocks showed the wearing action of water; two islands below were another lesson. In an eddy a short distance down the river, were found more evidences of water

work. A sand bar showed above the low water. It was also a peninsular, while the part nearest the bank was an isthmus. A little way back from the water was a terrace, or bluff, made by the river in the Champlain period. Here the layers of sand and clay showed water deposition in past ages. Other things of interest and value were observed and the class learned more in the two hours trip than could have been absorbed in a week from books.

This was one teacher and the objects of observation were local, but they are typical of what can be studied in almost every locality. If NATURE STUDY has a mission it is what its name implies. It is to plead for a study of nature itself and not through books. Books are all right in their place. They are necessary when we can not get knowledge first hand, but those in charge of the education of children have too long made a fetich of books and robbed children of their best legacy, the enjoyment and study of nature. We have all out doors for a school room. The strongest barrier, next to a conservative committee, is the teacher herself.

NATURE STUDY goes into the hands of many teachers, and to them we would say, and intend to keep on saying, "Get out of doors with your children."

An Easter Morning.

BY EARLE STAFFORD.

PART I. THE AWAKENING.

Early in the morning of Easter Sunday, I cast aside my blanket in the cool, dark pine grove, arose from my bed of needles, and made my way slowly through the ranks of lofty tree trunks, to the margin of the woods. The deep blue sky was still begemmed with stars, from which a

frosted radiance seemed to play, and the big round moon hung in the west on a vale of soft, transparent clouds. The cedar-dotted meadow before me was enshrouded in a soft light which neither revealed nor obscured the clumps of growth that rose above its level stretch, and in the distant east the faintest hue stood out a messenger of coming day. Feeling the chilling mystery, the hushed enchantment of the hour, I quietly retreated once more into the grove of darkness, wrapped myself in the folds of my cloak, and reclined to enjoy the rare peace which prevailed. My ears were alert to every sound, the cracking of a twig, the whisper of the night wind with its breath of bayberry and salt marshes, the rustle of the hoar-fringed grass in the meadow, and the regular peep of a hyla in a hidden swamp.

Through a ragged gap in the dark trees, I watched the moon sink, and lose, scarce perceptibly, her silver brilliancy, and finally drop behind a bar of clouds in the west. Then came a brief period, the darkest hour of the night; but soon the light of the rising sun swept over the resting world. I listened anxiously for the matin hymn to begin, and soon it did, as a soft far-traveled gleam filtered into the blackness of the grove. A Robin caroled by a distant farmhouse, and for five minutes the loved phrases of this rustic poet were the only music of the dawn. Then a low "kleouk" marked the steady flight of a party of Herons, as they winged through the dusk to their feeding grounds. I watched their gray forms from my rest among the pines. Soon a Meadowlark uttered his plaint, and from the light-touched uplands a Field Sparrow sent down his rippling flute into the quiet of the world below. Then came the wonderful chorus when the crisp air of morning throbs with the singing of birds, and I lingered in the woods until my little friend the Pine Warbler bid me, with his sweet and drowsy trill, to be off to the shore and the sunrise.

PART II. THE SUNRISE.

The great, level marshes reached away 'till lost in the morning mist. The air was thrilled with cold, and the bracing scent from the sea. The early beams struggled frozen through the haze, and I hastily pursued my way along the shore of a marsh creek, watching, as I hurried, the snowy Gulls at their *dawn* flying. In a cove a Kingfisher rattled by me in the gray, and a party of Mergansers splashed the cold water into foam, gave a few startled "quarks," and bent their sturdy flight to unsequestered shallows far away. From the meadows came the pipe of Robins, and the singing of the Sparrow hordes, while in a distant grove a large flock of Grackles chattered loudly to the morning. They seemed to be having a noisy debate. Suddenly a rosy edge began to appear above the horizon, and I ran to gain an advantageous height for a view of the scene to come. From the long bridge which runs over the bay to the beach, I watched the sun rise. Higher and higher rose the large red ball, 'till the lowest point on its circumference rested on the far away sea line. Then it swung clear of the great ocean and began in earnest its climb into the heaven. The huge orb did not seem real. Was this, indeed, the sun—the yellow brilliancy in the skies of daytime, that no man can face for long? It was, for, though my eyes could rest untroubled upon its carmine face, it gradually, as it ascended, grew smaller, brighter and lighter, and more natural, 'till I turned from it to other features, enjoying its warmth. Sheldrakes (Mergansers) sped over the bay in small groups, consisting in every case of the brownish females and the finely crested males. Crows trooped to the beach for their breakfast of fish, and white-bellied Swallows high in the air danced in sparkling floods of morning light. A proud Fish-hawk swung over the tide for miles without a wing-beat. In his strong talons he held a finny prey, and after watching it out of sight, I went back to my grove to follow the example of all the wild creatures—get my breakfast.

Cambridge, Mass.

Some Birds of Argentina.

Among Argentina's greatest treasures are her birds, which abound there in great number and variety. One peculiarity of the birds is their gaudy plumage, brightest scarlet, orange, olive, yellow, pink and green—painted perhaps by the southern sun.

In color they are beautiful and in song wonderful. Let us go to the woods bordering the river and see how many we can find. Yonder bird is called the "arm of fire" on account of his bright color. He appears to take great pride in showing himself. There is the cardinal with the scarlet crest, white breast and dove colored back, also the yellow cardinal with yellow body and black crest. It is so named because its crest resembles the cardinal's hat. That beautiful pink line that you see in the distant sky is a flock of pink flamingoes. They are nearing us. Now they alight upon the sand on the margin of the river. How pretty they are! Listen to that exquisite song. That is the "Bugero," a large black bird with white beak. From the grassy marsh comes the discordant cry of the heron, and the green parrots are chattering in the trees over our heads. They think their scolding will frighten us away. See that lovely golden wren creeping up the tree, hunting spiders. He does not seem a particle afraid of us. Hear that sweet-voiced robin. They are much finer singers than the robins of our country. Here we find a dove's carelessly-made nest, with two white eggs lying on the ground. This dove is very small, not much larger than a canary. That modest little gray bird is the bulbul or nightingale, which keeps his sweet song for the night.

There is a tree that appears to be covered with balls of cotton, but instead of cotton it is a flock of magpies sunning themselves. They drop their wings and fluff out the feathers of the back until they resemble balls of cotton. They are singular birds. One will catch a frog and run around before the others, apparently to tantalize them. When they bathe they jump into a pool of water, then out and roll in the dust, then into the water again. They impose on each other by several hens laying eggs in the same nest. The eggs are very pretty, green and white mingled. Hear the mournful call of the rainbird, a kind of cuckoo which calls almost incessantly the day before a storm, while there is no apparent evidence of its approach, yet they are unfailing. Here comes a scissors tail, another peculiar bird, one of the fly-catchers. Ah! the beautiful birds! We hear their glad songs as they flit from tree to

tree, seemingly without a sorrow, but they have their sorrows, too, for they will go to seek food for their young birds and come back and find them devoured by snakes or some other marauder. But perhaps their greatest enemy is women, for whose adornment hundreds of thousands are destroyed annually, especially of the heron, an elegant bird whose female has two dainty hair-like feathers, or aigrettes, which are much used for hat trimming.—*Montreal Family Herald.*

Curious Natural History.

It is interesting to know that among some country folk the curious idea still prevails that with the master die the bees. Somebody tells me that instances of this have been noticed of late. At a sale of the humble effects of a villager lately dead, two or three hives of bees in old straw skeps were disposed of; but when they came to be examined it was found that all the bees were dead.

A coincidence of this kind will probably keep alive the superstition in that village for generations to come.

Some curious specimens of folk-lore and natural history are contained in a rare book, called "The Sportsman's Dictionary," to which Mr. C. M. Woolsey has drawn my attention. This was published 160 years ago. The author was evidently a Philistine among Philistines in his attitude toward nature.

Of the master musician, the blackbird, he says: "This bird is not known to all persons and is better to be eaten than kept, being much sweeter to the palate when dead and well roasted, than to the ear while living. Sings about three months in the year, or four at most, though his song is worth nothing; but if he is taught to whistle he is of some value, it being very loud, though coarse." What an ear and mind!

And here is the story of the squirrel, with the ring in it of the seventeenth even more than the eighteenth century. It reminds one of the hares of Izaak Walton, that changed their sexes once a year.

"If what is reported of them be true, the admirable cunning of the squirrel appears in her (where we commonly use 'his' when the sex need not be specified, our ancestors often used 'her') swimming or passing over a river, for when she is constrained by hunger so to do, she seeks out some rind or small bark of a tree, which she sets upon the water, and then goes into it, and, holding up her

tail like a sail, lets the wind drive her to the other side, and carries meat in her mouth to prevent being famished by the length of the voyage."

Of the wild boar we have this: "And what place so ever he bites, whether man or dog, the heat of his teeth causes an inflammation in the wound. If, therefore, he does but touch the hair of a dog he burns it off, nay, huntsmen have tried the heat of his teeth by laying hairs on them as soon as he was dead, and they have shriveled up as if touched by a hot iron."—*London Express.*

Nature Study Lessons. XVIII.

BY EDWARD J. BURNHAM.

If, in our rambles last summer, we failed to secure insects from the brooks and ponds for our collection, it is not a serious matter. The brooks and ponds remain, and many beetles and bugs are living in them through the winter time. Besides, it is easy to get just where one wishes, when there is firm ice to walk upon. No boat is needed, no part is now inaccessible, and there is less danger of wetting the feet, which is disagreeable, whether it is really a grave matter or not.

Then again, the desire to add a few water beetles to the collection affords an incentive for a brief outing on a winter's day, which is invigorating and detightful for people, young or old, who are well and strong. Few pleasures equal that of a tramp over a creaking country highway with a troop of children on a clear winter's day, the crisp air jocund with laughter and instinct with the high spirits of childhood.

Presently comes a romp through the snow across a meadow, and then follows the hearty work of cutting a hole through the ice. This is the most exhilarating exercise of the day. Blow follows blow, the bits of ice flying in all directions, pelting now a muffled miss and now a graybeard, while the fun and frolic increase as the sturdy

boys "take turns." A channel is cut around an oblong perhaps a foot by a foot and a half in extent, leaving a big chunk of ice intact. At last the axe is driven through at some part of the channel, and now it is better that a grown-up take a hand. For the water is rushing upward as from a tiny geyser, caused by the pressure of the ice upon the surface of the pond. A few quick strokes in the splashing water releases the chunk of ice, which may now be heaved out, in the midst of increasing excitement, for it is more than likely that already a spry whirligig or a blundering dytiscus has seen the opening and hurried to come up to the light and air.

Every boy and girl knows the Whirligigs, the active, smooth, flat, black beetles, whose family name, Gyrinidæ, refers to their habit of going round and round on the surface of the water, where they gather in thick clusters or patches and appear as if they had all gone crazy at once. They are fond of air and sunshine, and, when the ice begins to melt, they find the very first holes that appear and begin hurrying round and round in the bits of water as if in wild delight that spring has come. In the same way, when a hole has been cut in the ice, there will almost always be a Whirligig on hand by the time the fragments of ice have been scooped out. The Whirligigs, when held in the hand, have a peculiar, not wholly unpleasant smell, as of apples just beginning to decay, suggestive of orchards and the heaps of pomace near cider-mills. They have four legs that are flattened, like oars, for swimming, while the front legs are fitted for grasping the tiny live things that they feed upon. Their eyes seem to be double—one pair looking upward and the other looking downward, so that the Whirligig can have an eye for enemies above and for food below at the same time. There are usually at least two kinds, or species, in any pond or brook, but the differences are slight, and it is enough for

the children to put the Whirligigs in box or row by themselves and label them Gyrinidæ.

There are two other kinds of beetles which one is sure to find in the water of a pond, and not infrequently in quiet pools in brooks. They are much alike in shape, being elongated, elliptical beetles, with two pairs of legs fitted for swimming. They belong to two great families—the Divers and the Scavengers. The Divers are rather more flattened, and their wing-covers are often roughened or furrowed, and sometimes marked with a yellow stripe or band. The Scavengers are shiny black.

Some of the Divers and Scavengers are the largest of the Water-beetles, and are always looked upon as real prizes by the children. Indeed, they have much about them to interest anyone. The easiest way to distinguish the two families, so far as the larger kinds of Water-beetles is concerned, is by a sharp spine which extends back between the hind legs of the Scavengers. Their antennæ, or "feelers," also, are shaped like a club, with the biggest end outward, while those of the Divers are threadlike.

The Divers live upon other insects and even upon small fishes; the Scavengers eat almost anything, from other insects to decaying vegetable matter. The Divers are so-called because they rise to the surface, raise their wing-covers, and gather air beneath them which they can draw upon for breathing while at the bottom of the pond. The Scavengers have a covering of fine hairs beneath the body which holds a quantity of air and gives them a silvery appearance when in the water. In the winter time, when the pond is frozen over, they are much less active than in summer, and need less air. Besides, I suppose there is barely ever a time when there are not air-holes in the ice, at least along the shore, where the rushes and bushes keep the ice melted around them.

When the Divers and the Scavengers have been taken home and separated, they should be pinned in different rows or boxes, the Divers being labeled Dytiscidæ, and the Scavengers Hydrophilidæ.

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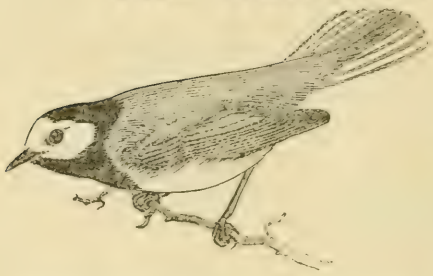

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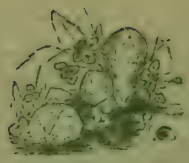

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"The vegetation slowly works its way over the surface of the water."
(Photo by W. H. Huse.)

NATURE STUDY.

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VOL. IV. December, 1903. No. 7.

Peat Bogs.

BY WILLIAM H. HUSE.

When the supply of coal begins to fail to such an extent as to materially increase its cost, peat, the first state of all coal, will come into more general use, either by simply drying as is done in Ireland and some other countries now, or by pressing into briquettes, producing a condition similar to that of some varieties of coal. The extent of peat bogs is hardly comparable with that of the coal fields, but it is large, more so than is generally supposed. One tenth of the entire surface of Ireland is covered with peat, as well as large portions of Scotland, England, France and other countries on the continent.

In this country peat bogs are common. Prof. Dana estimates that in Massachusetts alone there are 15,000,000,000 cubic feet of peat. In the north the vegetable deposit is made by moss and shrubs. In the south the swamps support large trees only, whose falling leaves and branches do not completely decay in the water. When an old tree topples over, its bulk is added to the general deposit.

Large rivers carry down logs and drift-wood of all sorts that sink or lodge against the bank when the slow water near the mouth is reached, and thus begin an accumulation of vegetable deposit. In 1835 Louisiana cleared out such a raft that was ten miles long, seven hundred feet wide and eighteen feet thick.

The Great Dismal Swamp in Virginia and North Carolina, forty miles long and twenty-five wide, is a typical southern peat bog. In the middle is a lake of clear, wine-colored water seven miles in diameter and fifteen feet deep. Here, as in the case of many other peat deposits the center of the swamp is higher than the shore. Sometimes when this condition exists an unusual flood loosens the peat and pours it in a devastating torrent of mud over the neighboring land.

Peat can be formed only in the presence of excess of moisture. Otherwise the decay is complete instead of partial. Cold assists in the prevention of complete oxidation; hence we find peat more abundant in high latitudes than low. There is present in such accumulations small quantities of humic acid and hydrocarbons similar to bitumen. These act as preservatives not only to the vegetable matter but animal as well that may be present. Bodies have been preserved for centuries in such swamps. In 1747 there was found in an English bog the body of a woman with skin, hair and nails nearly perfect and with sandals on her feet. In Ireland was found the body of a man dressed in coarse hair cloth eleven feet beneath the surface. A number of other bodies in similar conditions have been discovered and countless skeletons have been dug up in bogs.

It is interesting to study the growth of peat. Given a pond or lake with a growth of sphagnum and shrubs on the shore and the conditions are right. The vegetation slowly works its way outward over the surface of the wa-

ter. The moss leads the way and furnishes a foothold for bushes and water plants. Slowly, a few inches a century, the procession moves. The shaking surface makes a precarious footing for the unwary visitor. In time the entire surface is covered. As growth proceeds on the surface the mass sinks until the basin is filled with vegetable deposit. Where vegetable matter is brought by rivers and deposited, the rate of accumulation is much faster. Should such a deposit sink below the level of the sea and be covered with mud or sand it would be changed by pressure, first to lignite and then to coal after untold myriads of years.

A Hothouse Palm.

A number of rare and valuable palms were secured last week by the New York botanical gardens and were placed on exhibition in the palm house, the central and largest building of the conservatory range. Most of them were gifts from private collections, but by far the largest of the plants was obtained from the Central Park conservatories by exchange.

This palm is a fine specimen of Cocus Plumosa, which has attained a height of fifty feet and threatened to push its way through the roof of the tallest building in the Central Park range of glass houses. It has the honor of being the first plant to be given a fixed position in the garden palm house, all its neighbors being potted or else growing in large wooden tubs and boxes, while this plant was long since found to be too large and a too vigorous grower to be so treated.

It required seven men and a derrick to uproot it from its position in the park conservatories, but the gardeners of the botanical gardens managed to plant it in the palm house without a derrick. The uprooting, transporting and replanting required nearly six days' work. The plant is named from the plume-like grace of its great leaves, which remind one somewhat of the more familiar Kentia palms, but are fully fifteen feet in length.

The palm was planted directly in the soil and was surrounded with an attractive bit of rockwork, which in turn has been called upon to nourish many vines, begonias and more typical rock-loving

ness of the scene; and everywhere, in the court, in the garden, I found the new and silent guests who had taken possession of our places.

"Already the gathering mist of evening mingled with the last rays of the sun, and the slugs, tempted by the warm damp air, emerged in crowds from the leaves which strewed the garden-walks. They fared forth, slowly but surely, to feast on the fallen fruit. Clouds of wasps reveled in audacious pillage, tearing to pieces with their keen teeth our finest peaches and most luscious grapes.

"Our apple-trees, formerly so productive, were covered with net-work woven by the caterpillars, and offered us nothing but yellow foliage. In less than a year they had grown aged.

"I had never before been brought in contact with a world like this. My father's vigilance, and still more successfully, the assistance of the little birds, had preserved us from it. So, in my inexperience, and with a heart overcome by the spectacle of so much ruin, I cursed those whom one ought not to curse, because all creatures are from God.

"Later in life, but much later, I understood the designs of Providence. When man is absent, the insect ought to take his place, so that everything may pass through the great crucible, to be renewed or purified."

M. Michelet put this account by Madame Michelet in his book, "The Insect," from which many brief extracts have been reprinted in NATURE STUDY, and then went on to add some thoughts about the place of insects in nature's plan, which his wife's story of her visit to the deserted country-house had suggested to him. He showed how, as insects have many enemies, they must have weapons to defend themselves with, or they must have a shelter, or be protected by their color, so that their enemies cannot find them easily. Then, too, as they must eat, they must work, and to work well, they must have tools, and he named a long list of the "pincers, hooks, saws, pikes, augers, screws, rollers and dentilated teeth," which give them a terrifying appearance, but are really "the pacific tools with which they gain their livelihood, the implements

with which they do their regular work." This is common knowledge now, but it was all quite new and strange to most people when Michelet stopped to rest a little from writing big history-books about people who had long been dead to tell what he had found out about insects and their ways. He pointed out the fact that insects all have trades as well as tools, and then went on to say:

"The great achievement of the artist, or, to use the language of our ancient corporations, the test-work of this workman, by which he proves himself to be a master, is the cradle. In the insect world, as the mother generally dies in giving birth to her child, it is important to provide an ingenious asylum which shall protect and support the orphan, and supply the mother's place. So difficult a work requires tools which seem to us inexplicable. This, which you compare to a medieval poignard, to the subtly treacherous weapon of the Italian bravado, is, on the contrary, an instrument of love and maternity.

"For the rest, nature is so far from sharing our prejudices, dislikes, and childish apprehensions, that she seems specially to care for and protect the gnawing species which injuriously interfere with the economy of our small farms and plantations, but which, on the other hand, lend valuable assistance in maintaining the balance of species and keeping down the vegetable accumulation of certain climates. She preserves with watchful anxiety the caterpillars which we destroy. In the case of the oak-grub she is mindful to glaze over or varnish its eggs, so that, concealed under the withered leaf, and beaten by winds and rains, they may safely brave the winter. The crawling worms make their appearance clothed in and defended by a thick furry garb, which deceives their enemies, until, transformed into moths, they fly to and fro in happy freedom under cover of the night.

"For some she invents still greater precautions. Essential agents, undoubtedly, in the transformation of life, they possess, beyond all others, the guarantees of existence which secure them, infallibly, an immortality of race.

"The grubs [Aphids], for instance, alternately viviparous and oviparous, spring into full life in the summer, that they may the more quickly set to work, but are prduced in autumn in the shapeo of an egg, that they may the better endure the cold of winter. Finally, their generous mother reserves for this beloved species an un-

heard-of gift—that a moment of love shall give them the fecundity of forty generations!

"Creatures so highly privileged have evidently some task to execute, some great and important mission which renders them indispensable, and makes them an essential part of the harmony of the world. Suns are necessary, but so also are gnats. Grand is the order of the Milky Way, and no less that of the bee-hive. Who knows but that the life of the stars may be of minor importance? I see that some of them vanish, and God dispenses with them. But no genus of the Insect World ever fails to answer to the summons. If a single species of ants should disappear, their loss would be serious, and cause a dangerous gap in the universal economy."

The Bald Eagle.

W. J. Broderip was a genial English naturalist of the first half of the last century, who observed carefully, thought much, and jotted down his observations and reflections in a quaint and entertaining style. His "Leaves from the Note-Book of a Naturalist" is still read with profit as well as pleasure by naturalists who turn wearily from much that is now useless lumber which was written or compiled in Mr. Broderip's time. Even at this day, a writer upon the subject of instinct would scarcely consider his own work complete without reference to the young beaver that, deprived from birth of the least opportunity for parental precept or example, began the construction of a dam on the third floor of a London house, nearly eighty years ago.

Mr. Broderip was a Fellow of the Royal Society, and took a specially active interest in the living wild creatures in the Zoological Gardens. His story of the young condor that was hatched and brooded by a common Dorking fowl will be reprinted in NATURE STUDY some day, for "Leaves" from the "Note-Book" are quite rare now, and not easily accessible to youthful readers; but just at

this time our attention has been called to the "poor incarcerated white-headed eagles" which excited his interest and sympathy, and of which he wrote as follows:

"The female white-headed eagle (*Haliaetos leucocephalus*) laid her first egg on the 5th of April, 1845, and a second on the 8th of the same month, on a rough nest, composed of litter and twigs, &c., on the floor of her apartment in the eagle-hut at the garden in the Regent's Park.

"What a prison for a bird whose home is on the rock that shoots up from the lake, or the cliffs which overhang the mighty river or the wide sea! Niagara is a favorite resort of the white-headed, or bald eagle—the latter appellation a misnomer, for no bird has a better feathered head. There it sits or soars on the watch for the fish, and also for the carcases of squirrels, deer, bears, and other quadrupeds, which, in their attempts to cross the river above the falls, have been caught by the current and dashed down those awful cataracts.

"It is a very powerful bird, three feet long, and seven in alar extent; and has been seen flying off with a lamb ten days old; but it let the prey fall from a height of ten or twelve feet, in consequence of its struggles and the shouts of the spectator, who ran with loud halloos after the depredator; the poor lamb's back, however, was broken by the crushing swoop. Nay, a white-headed eagle has been known to seize and throw down an infant, and drag it for a short distance, when the cries of the mother, who had set down the little innocent to amuse itself while she weeded her garden, and the giving way of the child's dress, a portion of which the eagle bore off, saved its life. Thus was a second scene of the "Bird and Bantling" happily cut short.

"It will also attack old and sickly sheep, aiming furiously at their eyes.

"In short, he is the most determined brigand, whose

portrait has been admirably painted by Wilson. Look on this picture :—

'Elevated on the high dead limb of some gigantic tree, that commands a wide view of the neighboring shore and ocean, he seems calmly to contemplate the motions of the various feathered tribes that pursue their busy avocations below;—the snow-white gulls slowly winnowing the air; the busy tringæ coursing along the sands; trains of ducks streaming over the surface; silent and watchful cranes, intent and wading; clamorous crows, and all the winged multitudes that subsist by the bounty of this vast liquid magazine of Nature. High over all these hovers one whose action instantly arrests his attention. By his wide curvature of wing and sudden suspension in the air, he knows him to be the fish-hawk, settling over some devoted victim of the deep. His eye kindles at the sight, and balancing himself, with half-opened wings, on the branch, he watches the result. Down, rapid as an arrow from heaven, descends the distant object of his attention, the roar of its wings reaching the ear as it disappears in the deep, making the surges foam around. At this moment the eager looks of the eagle are all ardor, and, leveling his neck for flight, he sees the fish-hawk once more emerge, struggling with his prey, and mounting in the air with screams of exultation. These are the signal for our hero, who, launching into the air, instantly gives chase, soon gains on the fish-hawk; each exerts his utmost to mount above the other, displaying in these rencontres the most elegant and sublime ærial evolutions. The unencumbered eagle rapidly advances, and is just on the point of reaching his opponent, when, with a sudden scream, probably of despair and honest execration, the latter drops his fish. The eagle, poising himself for a moment, as if to take a more certain aim, descends like a whirlwind, snatches it in his grasp ere it reaches the water, and bears his ill-gotten booty silently away to the woods.'

"This is very beautiful and very poetical, and, what is more, very true. But there are two sides to a question, as there were to the shield about which the two silly knights fought. Turn we now to honest, homely Benjamin Franklin's view of the case."

The letter from which Mr. Broderip here quotes was

written by Dr. Franklin to Mrs. Bache, under date of Passy, January 26, 1784:

"For my own part, I wish the bald eagle had not been chosen as the representative of our country; he is a bird of bad moral character; he does not get his living honestly. You may have seen him perched on some dead tree, where, too lazy to fish for himself, he watches the labor of the fishing-hawk; and when that diligent bird has at length taken a fish, and is bearing it to his nest for the support of his mate and young ones, the bald eagle pursues him and takes it from him. With all this injustice he is never in good case, but, like those among men who live by sharping and robbing, he is generally poor, and often very lousy. Besides, he is a rank coward; the little king-bird, not bigger than a sparrow, attacks him boldly, and drives him out of the district. He is, therefore, by no means a proper emblem for the brave and honest Cincinnati of America, who have driven all the *king*-birds from our country, though exactly fit for that order of knights the French call *Chevaliers d'Industrie*. I am, on this account, not displeased that the figure is not known as a bald eagle, but looks more like a turkey. For, in truth, the turkey is, in comparison, a much more respectable bird, and withal a true original native of America. Eagles have been found in all countries, but the turkey was peculiar to ours; the first of the species seen in Europe being brought to France by the Jesuits from Canada, and served up at the wedding-table of Charles IX.

"He is, besides (though a little vain and silly, 'tis true, but not the worse emblem for that) a bird of courage, and would not hesitate to attack a grenadier of the British Guards, who should presume to invade his farm-yard with a *red* coat on."

"The editor of this interesting correspondence remarks that a learned friend had observed to him that the assertion about the first turkey being brought to France, etc., is a mistake, as turkeys were found in great plenty by Cortez when he invaded and conquered Mexico, before the time of Charles IX., and that this, and their being brought to old Spain, is mentioned by Peter Martyr of Angelina, who was secretary to the council of the Indies, established immediately after the discovery of America, and personally acquainted with Columbus.

"But, after all, the white-headed eagle is a bold fellow, and Mr. Gardiner relates that when riding within five or six rods of one, the bird, by raising his feathers and his general defying demeanor, seemed willing to dispute the ground with its owner."

Indian Women and the Birds.

Investigation by the government, through the Bureau of Ethnology, of the religious ceremonies of the Zuni and allied Indians in Arizona and New Mexico has brought out the interesting fact that in asking for favors from the spirit forces, or gods, to which they pray, these Indians do not forget to make special mention of the birds and to ask equal gifts for them.

The Indians think of their gods as like themselves, only more powerful, and so they think it is as necessary to show the gods what they want, as it is to pray for them. In 1870 the late Major J. W. Powell, so long the able Director of the American Bureau of Ethnology, was in Arizona and New Mexico, and had an opportunity to witness a secret religious ceremony, or "dance," which was observed for the purpose of praying for rain and good crops of corn, both for the people and for the birds.

Major Powell did not know then, but learned long afterwards, that the ceremony which he witnessed was a woman's "basket-dance." It would appear, therefore, that the thoughtfulness for the birds was suggested by the women, although the prayers were said by a male priest, or "shaman."

Major Powell wrote down the substance of the prayers, and was permitted to make a drawing of the altar—the first picture of such an altar ever made by a white man.

Here is his account of what he saw and heard at that midnight meeting under ground :

"The festival to which I am now to refer was continued through several days. At one time the shaman and the members of the shamanistic society over which he presided were gathered in a kiva, or under-ground assembly hall, where midnight prayers were made for abundant crops. On this occasion the customary altar was arranged with the paraphernalia for worship. Among other things were wooden tablets on which were painted the conventional picture-writings for clouds and lightning, below which were the conventional signs for raindrops, and below the raindrops were the conventional signs for growing corn.

"In order to more fully understand these picture-writings we will mention some of the other objects placed on the altar. There were wooden birds, painted and placed on perches ; there was an ewer of water about which corn was placed ; there was a case of jewels—crystals of quartz, fragments of turquoise, fragments of carnelian, and small garnets ; then there was a bowl of honey [honey-dew] upon the holy altar. When the shaman prayed he asked that the next harvest might be abundant like the last ; he prayed that they might have corn of many colors like the corn upon the altar ; he prayed that the corn might be ripened so as to be hard like the jewels upon the altar ; he prayed that the corn might be sweet like the honey upon the altar ; he prayed that the corn might be abundant for men and birds, and that the birds might be glad, for the gods loved the birds represented upon the altar as they love men. Then he prayed that the clouds would form like the clouds represented upon the altar, and that the clouds would flash lightning like the lightning on the altar, and that the clouds would rain showers like the showers represented upon the altar, and that the showers would

fall upon the growing corn like the corn upon the altar—so that men and birds and all living things would rejoice."

At this time, when kind-hearted white people are beginning to think of the birds, and to feed them when the snow covers the ground in our northern latitudes, it is interesting to know that the Indians of the arid western plains were accustomed to remember them and to pray for them at their religious meetings long ago—for it is well known that these rites of worship, or "dances," are very, very old.

Perhaps, also, the ladies of our Audubon and other societies will find a certain degree of satisfaction in the fact that the representation of birds at the altar and the prayer for them are not features of the men's "dances." They are associated peculiarly and distinctively with the "basket-dance" of the women.

A Meadow Lark in December.

On December 4 one of the editors of NATURE STUDY saw a meadow lark in East Manchester in a locality much frequented by this species in summer. The first real snow storm of the season had covered the ground to the depth of four or five inches and there was little in sight to attract a ground-feeding bird. The lark seemed wild and flew warily from tree to tree, finally settling upon a low bush at a distance. Frequent visits have failed to afford a sight of the lonely left-over since that date.

M. Yung, a French entomologist, has killed the ants in five hills by means of a poisonous gas, and undertaken the prodigious labor of counting the dead. The results, beginning from the smallest hill, were, respectively, as follows: Seventeen thousand eight hundred and twenty-eight, 19,333, 53,018, 64,470 and 93,964. The real figures probably averaged 5,000 higher in each case, as no allowance was made by M. Yung for absent and escaped ants.

Our Last Blossom.

Our last blossom is leaving us. A few belated flowers of summer or early fall may have kept it company for a while with their abnormally late beauty, but the witch-hazel outlasts them all and blossoms alone when other floal beauty has disappeared and while leaves are falling and all around is drear. It would be interesting to know the steps in the evolution by which this shrub left its mates and did violence to all humanly acknowledged ideas of propriety and order.

Its beauty is not obtruding. The dainty little yellow stars are often hid in the recesses of thicket and bog but when discovered the brown and grey background emphasizes the welcome dash of color, a reminder that all is not death in the apparent dying of vegetation. This fall blooming is not the only abnormal characteristic of the bush. The seeds remain quiescent during the winter, develop and grow during the entire summer and fall that follow and are thrown out violently when the little pericarps open just as next year's blossoms are opening to say "Goodbye" to the parting year.

All hail and farewell to the witch hazel.

Animals vary greatly in the length of their lives. Elephants, eagles and parrots may celebrate their hundredth birthday, but our domesticated beasts are thought to be aged when they have reached a quarter of a hundred. A horse is old at twenty, a donkey at twenty-five and a cat or dog at fifteen. The span of existence allotted to insects is shorter still, the fly and the butterfly commonly enjoying but one summer of vigorous life and then being taken off by the cold if they are not previously snapped up by a bird.

When we turn our eyes to the sky, it is in most cases merely to see whether it is likely to rain.—*Sir John Lubbock.*

The Wren and the Cricket.

The Cherokee Indians have many stories, called by the white man, who thinks he is wiser, myths or legends, but which often have at least a good-sized kernel of truth in them. Here is one that might serve a good purpose if told to white children:

"The little Wren is the messenger of the birds, and pries into everything. She gets up early in the morning and goes round to every house in the settlement to get news for the bird council. When a new baby is born she finds out whether it is a boy or girl and reports to the council. If it is a boy the birds sing in mournful chorus: 'Alas! the whistle of the arrow! my shins will burn," because the birds know that when the boy grows older he will hunt them with his blowgun and arrows and roast them on a stick.

"But if the baby is a girl, they are glad and sing: 'Thanks! the sound of the pestle! At her home I shall surely be able to scratch where she sweeps,' because they know that after a while they will be able to pick up stray grains where she beats the corn into meal.

When the Cricket hears that a girl is born, it also is glad, and says: 'Thanks! I shall sing in the house where she lives.' But if it is a boy, the Cricket laments: '*Gwe-he!* He will shoot me! He will shoot me!' because boys make little bows to shoot Crickets and Grasshoppers."

In the same field the farmer will notice the crop, geologists the fossils, botanists the flowers, artists the coloring, sportsmen the cover for game. Though we may all look at the same things, it does not at all follow that we should see them.—*Sir John Lubbock.*

Nature Study Lessons. XIX.

BY EDWARD J. BURNHAM.

People in general know less about the Hemiptera, or true bugs, than they do about the beetles and the butterflies and moths. They are for the most part disagreeable and even repulsive in appearance, and include in their number some of the most despised of all living creatures—as the lice and the bedbugs. But they are well worthy of study, nevertheless, both for themselves, as representing a distinct form of insect life, and because many species do a vast amount of harm to growing crops. The loss caused by the Hemiptera in this country alone amounts to many millions of dollars every year.

Yet not all the Hemiptera are disagreeable or injurious. Every boy and girl who is at all acquainted with the brooks and ponds knows the Water Striders—the slender-legged creatures that walk and even run upon the surface of the water. Perhaps some were taken last summer, and if so, they should be pinned in a row or box by themselves and labeled Hydrobatidæ, which is the name of the family to which they belong. Other harmless and rather attractive insects of this order are the Water-boatmen and the Back-swimmers. Like all the Hemiptera they have a sharp beak with which they pierce the objects from which they suck the juices. Some bugs suck the juices from plants, others from animals, the Water-boatmen and Back-swimmers belonging to the class of animal feeders. They live in the water, of course, and swim about very rapidly by means of a pair of oar-like legs that are very long and very strong.

The Back-swimmers are the queerer, because their backs are shaped like a boat and they swim about or rest at the surface bottom side upward. Some kinds of these

queer Back-swimmers that are most common in the East are very handsome insects indeed.

The Water-boatmen have flat backs, and swim with their backs upward. They prefer to rest at or near the bottom of ponds, clinging to the vegetation on which the creatures feed which they in turn catch and feed upon. They take down air with them, something as the Diving-beetles do, and as the air and their bodies together are lighter than the water, they must hold on to something or keep swimming downward, else they rise swiftly to the surface, like a piece of cork.

The Water-boatmen, known by their flat backs, should be pinned in a row and labeled Corisidæ, while the Back-swimmers should be pinned near them and labeled Notonectidæ.

Not infrequently one will find a big, flat, brown bug in the water, which is the largest of all the bugs in this country. It is often nearly two inches in length, its sharp beak is a quarter of an inch long, and its front legs are grooved so that one part can be closed into another like the blade of a penknife. It can catch and hold small fishes, sucking the blood and other juices from them at its leisure. As they often fly from one pond to another at night, they are attracted by the electric lights of cities and villages, and are sometimes found lying in the streets in considerable numbers. These big bugs—"Electric-light bugs" some people call them—belong to the family Belostomidæ, which includes the largest Hemiptera now known anywhere in the world.

There are four or five other kinds of bugs that live in the water or by it on the shore, which sharp-eyed boys and girls will occasionally find, but they are rather rare, not easily described, and have big names. So for the present, if any such are found, it is best to pin them in a little group by themselves in the Hemiptera box, and wait until

the books on insects have been studied and museums visited.

On land there are many kinds of Hemiptera, or bugs, and they vary greatly in appearance and habits; but all have the sharp, jointed beak, which, when not in use, is bent underneath the head and reaches back between the front pair of legs. They are for the most part small insects, and as a rule are not so well adapted to a child's collection as are the beetles, grasshoppers, butterflies and moths. There are a few families of the land-bugs, however, which are of some considerable size, although none approach the Belostomidæ in that respect.

While many of the bug kind injure growing crops, the members of several families live by catching other insects and sucking the juices from them. It is not an uncommon sight in summer to see a bug with a squirming caterpillar impaled on its sharp beak. Even those that live on the juices of plants do much good by destroying rank vegetation which, especially in warm countries, would soon disturb what is called "the balance of nature" if unchecked. But that is something one can understand better as one gets older, and comes to know about oxygen and carbonic acid gas and such things.

In any collection of Hemiptera there are almost certain to be found some Assassin-bugs and some Ambush-bugs. There are more than one hundred American species of the former family, and they are found almost everywhere, roaming over plants and trees, in the open fields, and even in houses, in basements and rooms that are little used. They are strongly built, fierce-looking bugs, and their beak has only three joints, as can readily be seen with a pocket lens. The Assassin-bugs belong to the family Reduviidæ.

There is often found in flowers, where it is watching for its prey, a greenish bug with a black band across its very

broad abdomen. This is an Ambush-bug, which is lying in wait for the insects that come to sip the nectar. It is especially abundant among the flowers of the golden-rod. If any are found in the collection, they should be labeled Phymatidæ.

The Squash-bugs are well known to all who live in the country, and they are also not infrequently found in city gardens. They belong to the family Coreidæ.

Many of the bug tribe are protected from their enemies by a disagreeable odor and taste, the Squash-bugs affording a familiar example, but there is one family whose members have this sort of protection in so marked a degree that they are known distinctively as the Stink-bugs. These frequently live on berry bushes and leave their offensive trail on the berries. But notwithstanding their smell, some of these bugs are very useful, since they wage relentless war on the Potato-beetle. They can be known by counting the five joints in their antennæ. They belong to the family Pentatomidæ.

There are many other families of the true bugs, but the individuals are mostly small and the family marks are not easily recognized by beginners. Besides, perhaps this is enough for a first lesson about bugs, anyway.

Penguins have an extraordinary amount of vitality and are harder to kill than any ordinary cat. The writer once had an occasion to kill a large bird aboard his ship, the Southern Cross, and, making use of the weapon next his hand, he drove a large spike squarely through the creature's head and finished the operation by nailing it fast to the deck. That seemed to make the job very complete, and he went below deck for dinner. Coming up an hour later, his astonishment was prodigious on beholding the penguin, head erect, flippers out, waddling about, apparently without thought of the spike, which still remained transfixed in his cranium.—*Menominee, Mich., Herald.*

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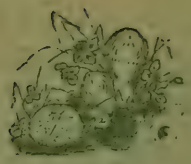

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Two Places of Interest.

BY JOSEPH N. PROKES.

If we glance at the map of North America we find that the state of Minnesota is situated exactly in the central part of the continent. We learn from students of geology that about ten thousand years ago much of the surface of North America was covered by a thick sheet of ice, which advanced slowly from the north and more recently as slowly retreated. The period of ice-advance is known to geologists as the glacial period. Throughout Minnesota are to be found traces of this glacial action.

Four miles west from the village of Jackson, Jackson county, Minnesota, lies a sheet of water known as Clear Lake, and this is a typical hollowed out glacial lake. The banks are high, formed out of drift boulders of every dimension, round and smooth, piled irregularly, and here is the Mecca of the collector. Along this hard gravel shore beautiful specimens of quartz, agate, jasper and carnelian are found, varying in size from a filbert to some weighing four ounces.

If one is interested in archæological studies, he can follow the footsteps directing to a high promontory on the south side of the lake, and here is where man in his native and barbarous capacity established his village.

At last if you are a botanist you above all admire the flora. In the thickets, we find the wild plum; the thorn, with its sharp spines, and the crab-apple, with its fragrant blossoms. Here, too, are climbing plants, such as the woodbine, the bittersweet, the ivy, the frost grape, and the honeysuckle. And in the shady places among the ferns we may gather the golden mandrakes; and dig the ginseng, the spikenard and sarsaparilla, for the sick and the wounded. In June the air is fragrant with the perfume of wild roses, which form a thick growth in places among the gravel.

Should your interest lead you in the direction of entomology you might stop to watch the tumble bug (*Canthon lævis* Drury) as the two sexes work together rolling the ball of dung which now is rounded and compressed by rolling in dusty places and now they finally bury it in the ground. The male now leaves, and the female eats out a cavity in the ball, in which she deposits an enormously large and soft egg; this done, she again closes the cavity by plastering the removed portion of the dung over it. Meanwhile we pick from the ground an adult snapping beetle and try him for his acrobatic performance. We touch him very lightly; the beetle drops to the ground, landing on his back; after remaining perfectly quiet for a time, as if dead, we hear a sudden click, the beetle pops into the air, and falling upon its short legs, runs away.

However fascinating the vicinity of Clear Lake is, nevertheless other places are inviting as well, and notable among these is the calcareous tufa locality situated two miles from the village of Jackson on the bluffs of the Des Moines river. Here in a deep ravine a little on the hill-

side we find the orifice of the now extinct calcareous spring. The water, as evidence indicates, gushed out long ago and deposited its calcareous load upon the surface over which it flowed. The moss that grew, leaves and stems that were in its path were incrusted with carbonate of lime, and these in time decayed, leaving the moulds. This deposit formed in layers about a foot thick, binding each other like steps now long covered with decayed vegetable matter, and upon this the lichens and ferns established their abode. At this spot the student of mineralogy eagerly excavates for the layers and as the chunks are brought out one by one they are carefully examined and the parts showing the organic inclusions most interestingly are broken off, thoroughly cleaned and washed in the creek below. Many mineralogical-geological cabinets have this material already represented. However as long as the material is available the lover of minerals will at lesiure often come to the spot and as he will break off a slab will utter to himself, "This is lots better than the one before."

Nature Study in India.

The report of deaths from venomous snakes and wild beasts in India during 1902 has just been issued and advertises the beauties of living in that tropical clime adjacent to the isle "where every prospect pleases and only man is vile." Snakes are responsible for the death of 23,166 human beings and 9,019 cattle. Wild beasts, mostly tigers, killed 2,836 people and 80,796 cattle. The total of all these deaths is 115,817, while the wild beasts and snakes that were killed, for which rewards were paid, numbered 87,578. The lower animals seem to be getting the best of the contest.

A goose flies by a chart the Royal Geographical Society could not mend.—*Oliver Wendell Holmes.*

Cherokee Plant Lore.

Writing of plant lore among the Cherokee Indians for the nineteenth annual report of the Bureau of American Ethnology, Mr. James Mooney gives an account of Indian botanical fancies that, stripped of the technical terms in which it abounds, may be of interest to the youthful readers of NATURE STUDY.

The Cherokee have always been an agricultural people, and their old country is a region of luxuriant flora, with tall trees and tangled undergrowth on the slopes and ridges, and myriad bright-tinted blossoms and sweet wild fruits along the running streams. The vegetable kingdom consequently holds a far more important place in the mythology and ceremonial of the tribe than it does among the Indians of the treeless plains and arid sage deserts of the West, most of the beliefs and customs in this connection centering around the practice of medicine, as expounded by the priests and doctors in every settlement. In general it is held that the plant world is friendly to the human species, and constantly at the willing service of the doctors to counteract the jealous hostility of the animals. The sacred formulas contain many curious instructions for the gathering and preparation of the medicinal roots and barks, which are selected chiefly in accordance with the theory of correspondences.

The Indians are close observers, and some of their plant names are peculiarly apt. Thus the mistletoe, which never grows alone, but is found always with its roots fixed in the bark of some supporting tree or shrub from which it draws its sustenance, is called by a name which signifies, "it is married." The violet is still called by a plural name, "they pull each other's heads off," showing that the Cherokee children have discovered a game not un-

known among our own. The bear-grass, with its long, slender leaves like diminutive blades of corn, is called "greensnake," and the larger grass known as Job's tears, on account of its glossy, rounded grains, which the Indian children use for necklaces, is called, "the mother of corn." The black-eyed Susan of our children is the "deer-eye" of the Cherokee, and our lady-slipper is their "partridge moccasin." The May-apple, with its umbrella-shaped top, is called "it wears a hat," while the white puff-ball fungus is "the little star," and the common rock lichen bears the musical, if rather unpoetic, name of *utseleta*, "pot scrapings." Some plants are named from their real or supposed place in the animal economy, as the wild rose, "the rabbits eat it"—referring to the seed berries—and the shield fern, "the bear lies on it." Others, again, are named from their domestic or ceremonial uses, as the fleabane, called "the fire maker," because its dried stalk was anciently employed in producing fire by friction, and the bugle-weed, called "the talkers," because the chewed root, given to children to swallow, or rubbed upon their lips, is supposed to endow them with the gift of eloquence.

Some few, in addition to the ordinary term, in use among the common people, have a sacred or symbolic name, used only by the priests and doctors in the prayer formulas. Thus ginseng, or "sang," as it is more often called by the white mountaineers, is known to the common people as "the mountain climber," but is addressed in the formulas as "the little man," while corn is invoked under the name of "the old woman."

The division of the trees into evergreen and deciduous is accounted for by a myth, or ancient story, which relates that some trees lose their leaves in winter time as a punishment for their failure to endure an ordeal, or test of fidelity and fortitude, to the end.

With the Cherokee, as with nearly all other tribes east

and west, the cedar is held sacred above all other trees. The reasons for this reverence are easily found in its ever-living green, its balsamic fragrance and the beautiful color of its fine-grained wood, unwarping and practically undecaying. The small green twigs are thrown upon the fire as incense in certain ceremonies, to counteract the effect of what are called "asgina" dreams, as it is believed that the anisgina, or wicked spirits, cannot endure the smell; but the wood itself is considered too sacred to be used as fuel. In the war dance, the scalp trophies, stretched on small hoops, were hung upon a cedar sapling trimmed and decorated for the occasion.

According to a myth, the red color came originally from the blood of a wicked magician, whose severed head was hung at the top of a red cedar. It happened, once upon a time, that this magician disturbed the course of the sun, until at last two brave warriors sought him out and killed him in his cave. They cut off his head and brought it home with them to show the people, but it continued still alive. To make it die they were advised to tie it in the topmost branches of a tree. This they did, trying one tree after another, but each morning the head was found at the foot of the tree and still alive. At last they tied it in a cedar, and there the head remained until it was dead, while the blood slowly trickling down along the trunk gave the wood its red color, and henceforth the cedar was a "medicine tree."

Curious Effects of Cold.

Experiments with liquid air show queer effects of intense cold. A rubber ball immersed in it becomes very brittle, while a ball of lead becomes elastic and will rebound like rubber.

The Love of Life.

It is one of the many good things about nature study that it tends to awaken sympathy for all living things. Indeed, this is true of science, also, for scientific investigation leads to reverence for all forms of life, since in whatever form it is manifested, life is still one of the profoundest and most solemn of the mysteries.

The life of an insect, a reptile or even a worm is precious in the sight of the sincere nature lover, and of the true scientist as well. Many instances are known where men who prosecuted studies in natural history all their lives grew more and more considerate of the creatures it was necessary for them to kill. Not only did the good English rector, William Kirby, whose great work on insects is still sought after, comfort himself with the assurance that he had saved the lives of as many that had fallen in the water as he had destroyed in all his studies, but the great anatomist, Lyonnet, who lived for years with a scalpel almost constantly in hand, was wont to boast that in prosecuting his remarkable investigation of the muscular structure of the willow grub, he was able to bring his prolonged labors to a conclusion without killing more than eight or nine individuals of the species he wished to describe.

A gentleman who for several years made a special study of the dragon-flies, which many people foolishly fear, came to have such sympathy with the joyous life of these beautiful denizens of the air that, although often afield with his net, he would frequently watch them for hours without attempting a single capture.

Those who have learned to value life for life's sake—for the wonder and beauty of it—will not hastily declare Jules Michelet extravagant when he wrote concerning an entomological journey in Switzerland that "A fly hid from us

the Alps; the agony of a beetle, which was ten days dying, veiled Mont Blanc from our gaze; in the anatomy of an ant we forgot the Jungfrau."

But the beetle was actually more than ten days dying. The quick effect upon insects of cyanide of potassium was not then known, and in the journal which Madame Michelet kept of this same sojourn in Switzerland is the following account of the remarkable vitality of a stag beetle. It is interesting, both for the hint it contains of the cruel practice once in vogue of pinning insects alive, and as illustrating the crude methods to which even the tender-hearted were obliged to resort in the earlier days of entomological investigation:

"But soon I discovered that I was not utterly alone. Bees, or drones, which had also risen early, were already at work, seeking in the cups of the flowers the honey distilled beneath the dew, penetrating into the depths of the campanulas, or skilfully gliding into the mysterious corolla of the charming Venus's Slipper. Brilliant cicindelas opened the hunt after the gnats, while more unwieldy tribes sought their livelihood at the bottom of the herbage.

"On this day, then, the 20th of July, allowing my glance to fall mechanically at my feet, and withdrawing my eyes from the too luminous picture, I saw with astonishment a scene which vividly contrasted with this attractive and holy spot—an atrocious warlike struggle. The insect-giant which we call the stag-beetle, one of the largest of European species, a black shining mass, whose horns bristle with superb crescent-wise pincers, had seized upon a beetle of far inferior size. Nevertheless, the two enemies, being equally provided with admirable defensive arms, after the fashion of the corselets, armlets, and cuisses of our ancient knights, the struggle was long and fierce. Both belonged to the murderous race which prey on little insects—were powerful lords in the habit of devouring

their vassals. Whichever had fallen victim in the fray, the Lilliputian people had certainly applauded. However, the blind instinctive movement which leads us, in such cases, to separate the combatants, induced me to interfere; and with the point of my umbrella, skilfully, delicately, and without wounding the two antagonists, I compelled the stronger of the two to release its grasp.

"The captive thus secured was, without form of trial, adjudged to undergo our investigations as a punishment for his fratricidal voracity. Our system, however, is not to impale the insect—a horrible punishment and a pitiful spectacle which has no end; for a month afterwards, ay, and more, you will see the poor transfixed wretches writhing in agony. Ether generally kills them rapidly, and apparently painlessly. Well, then, we *etherized* our prisoner largely. In a moment he spun round and fell; we thought him finished. An hour or two passed, and lo! he was once more alive, once more upright on trembling feet, and attempting to walk; he fell, and again he rose. But, to tell the truth, his gait was like that of a drunken man. A child would have laughed at it. We had no desire to laugh, being obliged to poison him a second time. A stronger dose was accordingly administered; but in vain—he came again to himself. It was a curious circumstance; but it certainly seemed as if this kind of intoxication, while weakening and almost paralyzing the faculties of motion, had all the more keenly excited the nerves, and what we may call the amorous faculties. The use he sought to make of his vacillating step and last efforts was to join a female of his species which he had found lying dead, and placed upon the table. He felt her with his palpi and trembling arms. He contrived to turn her over, and tumbled about (very probably he could not see) to assure himself whether she was alive. He would not part from her; one would have sworn that he had undertaken,

though dying, to resuscitate the dead. It was a fantastic, a gloomy, and yet, for one who knows at heart that all nature is identical, a touching spectacle.

"It afflicted us greatly; we attempted to shorten it by the help of the ether, and to separate this Juliet from her Romeo. But the indomitable male laughed at all our poisons, and dismally dragged himself along. We shut him up in a large box, where he did not die until after a considerable period, and incredibly large doses. His punishment—and, reader, you may justly call it *ours*—endured for fully fifteen days."

The Rabbit's Home.

"There, Mrs. Rabbit, that brush-heap
Will make for us a splendid home,
We'll build our nest just right in there,
And all around it we can roam;
Then soon as we e'er spy a dog,
Right in it we will quickly run,
While he will have to stay outside
And miss anticipated fun.

"We'll run from men who carry guns,
As soon as we e'er see them near;
For they can knock us when not close,
Which always seems so very queer.
'Tis dogs and men that we fear most
Of all the things that come around;
But when we hide beneath that brush,
We cannot very soon be found.

"Oh! here they come, both dogs and men,
Run quickly, let us go and hide.—
But what is that bright light out there,
Which creeps around on every side?
O, my! how warm it's getting here.
My dear, our home's on fire, I'm sure,
Ah! Mrs. Rabbit, how can we
The fearful heat ever endure?

"Outside, the dogs and men are there;
A dash for life we'll have to make.
Oh! come right quickly—don't get caught,
Yes, run for life and for my sake."
Then out they sped and tricked the dogs
By running in a hollow tree,
While dogs all had to stay outside—
And very discontented be.

Martha Shepard Lippincott, in Boston Courier.

The Oven-bird's Song.

The songs of all birds gain in beauty when they are uttered on the wing. They seem to be delivered with more abandon and greater volume. The water thrush's first cousin, the oven-bird, furnishes a striking example of this. His ordinary song consists of a repetition of the same note, hammered out with a constant crescendo.

Very effective it is, too, as a part of the general music of the forest, though lacking individual attractivness on account of the monotony of its iteration. But when the bird rises above the treetops and descends after the fashion of the indigo bird to an accompaniment of scattered notes he takes far higher rank as a performer.

Not always, however, does he require the exhilaration and inspiration of an aerial toboggan to cause him to abandon his plain chant for a more florid song. I have heard him sing the latter, perched on a grapevine not two feet above the ground. And as if to show that he did not reserve his superior powers for special occasions, he mingled it with his plain chant and ending with the song and sometimes reversing this order.

I love to see the oven-bird on the ground. There is such a ludicrous assumption of dignity on his part as he strides about the stage, never for a moment forgetting himself so far as to hop. There is the same even, measured steadiness about his movements that there is in his chant. It is only when he launches himself into the effervescing song that he forgets his staid demeanor.—*Lippincott's.*

After years of study devoted to the topic, Professor Alfred Newton of Cambridge stated that without doubt bird migration is the greatest mystery in the entire animal kingdom, "a mystery," he said, "that can be no more explained by the modern man of science than by the simple-minded savage of antiquity."

Hatching a Condor.

As long ago as 1844, the Zoological Society of London had received a pair of condors from the Andes in South America. They were kept in a large cage in the menagerie in Regent's Park, and, singularly enough, proved very disappointing to many who saw them. They were in reality fine, large birds, the old male measuring eleven feet in the spread of his wings, and being four feet nine inches in length. But there had been so many extravagant things written about the condor that people expected to see monstrous birds, many feet in length, and with wings expanding twenty or thirty feet.

One keen observer was not disappointed, however, and he was our old friend Broderip, whose "Note-book" has been drawn upon so frequently for the readers of NATURE STUDY. He watched the great birds day after day and month after month, and wrote many pages about them in that commonplace book of his from which the "Leaves" were afterwards to be taken.

The condors evidently felt that a cage was no place for their children, if they had any; so, although the female laid several eggs, she never sat upon them. But the Zoological Society wanted a young condor very much, and as there were no artificial incubators in those days, such as poultrymen use now, it was necessary to find a sort of stepmother that would try to hatch a condor, and care for it when hatched. Mr. Broderip, in his quaint way, tells how this was successfully accomplished:

At the time the present note was taken, the female condor in the Regent's Park had laid seven eggs. The first was laid on the 4th of March, 1844; the second on the 29th of April of the same year; the third on the 28th of February, 1845; the fourth on the 24th of April in that year; the fifth on the 8th of February, 1846; the sixth on the 3rd of April, 1046; and the seventh on the 7th of May, 1846.

On one occasion, I saw the condors with a newly-laid white egg, some three or four inches long, lying on the naked floor of their prison. There was no appearance of a nest of any kind, and there was something melancholy and yet ludicrous in the hopeless expression with which both parents looked down at it. They regarded the egg and then each other, as if they would have said, if they could, "What are we to do with it now we have got it?" And the mute mutual answer of their forlorn eyes and dejected heads was, evidently, "Nothing."

Well, at last, it was proposed that, as soon as another egg was laid, it should be placed under a hen. Accordingly, on the 7th of May, at half past seven o'clock, A. M., (I must be pardoned for being somewhat particular on such an occasion) the newly-laid egg was put under a good motherly looking nurse of the Dorking breed, and, as the colors of hens as well as of horses are worthy of note, let it be remembered that her color was white, inclining to buff.

The place of incubation was a cage elevated some distance above the floor in one of the aviaries. The hen sat very close. Day after day, week after week, passed away; still the exellent nurse continued to sit. Day after day, week after week, again rolled on, and the usual period at which the anxious feathered mother beholds her natural offspring was left far behind. Still the good nurse sat on, till at last, after an incubation of *fifty-four days*, the young condor, on the 30th of June, 1846, about six o'clock in the morning, began to break the wall of his procreant prison. The process of hatching was very slow. The young bird was not extricated from the egg until after twenty-seven hours, nor was it then released—on the morning of the 1st of July—without the assistance of the keeper, who found it was necessary to remove the shell, as the membrane had got dry round the nestling. Thus came into this best of all possible worlds the first condor hatched in England. It had an odd appearance, and seemed to wonder how it had got here. The head appeared to be misshapen, for on the top of it was what looked like an amorphous bladder of water contained between the external skin and the skull. This gradually disappeared, and when I first saw it, on the same first of July, about four o'clock in the afternoon, the head was properly shaped. It was naked, and of a dark lead color; and such was the hue of the just visible comb (showing that it was a male) and of the naked feet. With these exceptions the young bird was covered with a dirty white down, and looked healthy and vigorous. On the evening of the day on which it was hatched it ate part of the liver of a young rabbit.

The young condor was fed five times each day with the fleshy parts of young rabbits; at each feed a piece about the size of a walnut was given, and it was very fond of the liver. For the first ten days it was fed, and after that time it pecked the food from the hand of the keeper. It took no water, nor was any forced on it.

I find also, the following in my note-book :—

July 18.—The young condor continues to thrive apace, and the good hen that hatched the egg from which this portentous chick sprung still remains in the elevated cage, and seems very much attached to her charge. When feeding—for which purpose she quits the nestling only twice a day, hurrying back as if anxious to resume her duty—she is fussy and fidgety (if there be such words) till her hasty meals are ended. The young condor's down is now changed to a more gray hue, and the germs of true feathers begin to show themselves. The head and neck have become blacker, and the budding excrescence of the comb advances. The upper mandible of the bill is slightly movable. The lower extremities are become darker and very stout, but as yet too weak to support the bird's weight.

May not this local, but no doubt natural weakness, point to the solution of the continued close attention of the hen? Her duty with her own eggs is to hatch chickens that run very soon after they have left the egg-shell, but till they are strong enough to be able to trust to their lower extremities she keeps them close, "hiving them," as the old wives say, carefully, till these lower extremities, which are, in the nestlings of the gallinaceous tribe, first well developed, shall be sufficiently strong to carry them in search of food and out of danger. The hen, in this instance, finds that her Gargantua of a chick cannot walk, and therefore goes on cherishing it and sitting close over it. I saw it fed about three o'clock in the afternoon upon part of a young rabbit, nearly the whole of which it had consumed in the course of yesterday and today. When brought out it shivered its callow wings and opened its mouth like other nestlings, but it *then* uttered no cry. It made much use of the tongue in taking the food and in deglutition.

On my return from making these observations I went to look at the old condors. Military bands were playing, and the wind was very high. Both birds were very much excited, the male especially. He spread and flapped his wings, pursuing the female, as she walked backwards from him, with his beak opposite and close to hers, and gesticulating vehemently and oddly.

The next entry is a sad one :—

July 21, 1846.—The young condor, after thriving well to all ap-

pearance, died this morning. The good hen, which had been most attentive to it to the last, seemed to miss it much. The cry of the young condor resembled the squeak of a rat, and the dwelling-place of the hen and her charge was infested by those predacious rodents. Sometimes they would squeak, and then the bereaved foster-mother would approach the hole whence the squeak proceeded, listen, and abide there, clucking, as if in hope of seeing her charge come forth.

New Theories of Matter.

In view of recent discoveries regarding radium, Prof. F. W. Clarke again advances the theory, advocated by him years ago, that the various elements are evolved out of substances less complex than themselves. The composition of the nebulæ is found to be very simple, that of the stars more complex, while a solid body like the earth contains a large number of elements and thousands of compounds.

The theory is also proposed that in radio-activity we witness the decay of elements.

Tornadoes.

A curious phenomenon in connection with tornadoes, for some time unexplained, is the blowing outward of windows and walls of houses. This is due to the partial vacuum in the center of the whirling current of air. Towards this all the surrounding air rushes with tremendous force. At Gainesville, Georgia, last June, the walls of a mill were blown outward while the roof was lifted and suspended in the air for several seconds before it dropped. A stand pipe forty feet in diameter had its cover, weighing several tons, carried high into the air and dropped 100 feet away.

A Phenomenon of the Wind.

A frequent phenomenon in winter is the dying down of the wind at sunset after a windy day, followed by its rise again with the rising sun in the morning. A theory that has been advanced to account for this is that with the cooling of the atmosphere at night a stratum of cold and therefore heavy air settles to earth, preventing the winds that still blow from reaching the ground. In the morning the rising sun warms the air in this lowest stratum, it rises and the winds drop to the surface of the earth again. The comparatively common exceptions to this might be explained in two ways. The wind might at times be so strong as to move this lower stratum, or the atmosphere might be so uniformly cold that there would be no distinct lower stratum.

Kingbird and Oriole.

The difference in the nature of kingbird and oriole is strikingly exhibited in the style of their nests. The kingbird hasn't a particle of imagination, not an atom of the artistic. His shape, dress and voice declare it. He is hard headed, straightforward and serious, somewhat overbearing, perhaps, and testy, but businesslike and refined in all his tastes. His nest is himself over again—strong, plain, adequate, but like its builder, refined. Contrast the oriole's. Romance, poetry and that indescribabe touch—the light, easy, negligent touch of the artist—in every line of it! Why, the thing was actually woven of new mown hay—as if one should build his house of sandalwood—with all the scent of the hay field about it. I put my nose near and took a deep, delicious breath. The birds had selected and cut the grass themselves and worked it in while green. Some of it was uncured, still soft and sweet with sap. One side, exposed to the sun through a leaf rift, had gone a golden yellow, but the other side, deeply shaded the day through, was yet green and making more slowly under the leaves. And this nest was woven, not built up like the kingbird's; it was hung, not saddled upon the limb, suspended from the slenderest of forks so that every little breeze would rock it. And so loosely woven, so deftly, slightly tied!—*National Magazine.*

Nature Study Lessons. XX.

BY EDWARD J. BURNHAM.

Butterflies and moths are among the first insects to attract attention. The butterflies, by their beauty of color and grace of motion, add to the charm of every summer landscape, while the moths are inseparably associated with early memories of twilight hours. Along with the beetles, they are among the first to appear in every embryo collection, and fortunately some of the forms are so distinct and so well known that the beginnings of a classification may be made at once, although the great order of Lepidoptera, in its many branches, offers to the most diligent an opportunity for a lifetime of study.

Parents who are at all willing to assist their children in nature study will of course see that some helpful book is at hand. Some of these are now published at so low a price as to be within the reach of all, while the more costly works, with elaborate colored plates, should be in every public library. Where it is possible, visits should be made to a museum and a happy hour passed in the study of the collection. Where there is no museum near at hand, parents, teachers, school authorities, library trustees and all interested in the development of children should unite in the work of forming one, the beginnings of which may be placed in the school-room or in the library.

In a lesson like the present it is impossible to mention even by name the many family groups of an order whose representatives are legion. Their larvæ, or caterpillars, are everywhere and feed upon every growing thing. Every plant has one or more enemies among the countless host. Some feed upon the leaves, some live within the fruit, a few bore into the solid wood, many live in the stalks of grasses, and one even feeds under water in the stems of

water-lilies; and each kind of caterpillar changes at length into its own particular species of moth or butterfly.

So a lifetime is not long enough in which to learn about them all, but there are certain groups that are so distinct or so common that they can be easily recognized, even by the children, with a little assistance, and these may form the beginnings of a collection. For example, the Promethea moth is the most common of the Giant Silk-worm family, or Saturniidæ. Its cocoons are often found in winter, rolled up in a leaf and hanging to the slender branches of small wild cherry-trees. I know many boys and girls, and not a few men and women who were boys and girls once, who will often go clambering and frolicking through deep snow to some bush or tree of the wild cherry or ash, "just to see." When found, these cocoons can be taken home, still attached to the twigs, and in the spring or early summer there will emerge from each a beautiful reddish-brown moth, which has been named *Callosamia promēthea*.

Another moth of this family, and the largest of the Giant Silk-worms, is the Cecropia. This expands from five to six inches, and is dusky brown in color, with a band of white across the wings and a broad outer margin of red. The cocoon, which is two or three inches long, and made of coarsely woven silk, is found on many kinds of forest trees, but instead of hanging perpendicularly, like the cocoon of Promethea, it is fastened for its entire length longitudinally to a twig.

Still another member of this family is the Luna moth, the female of which has bright green wings, with long extensions or "tails" at the extremities of the hind ones. This is *Tropæa luna*, and is known to almost everyone in the country because of its size and peculiar form.

A very few of these three kinds of moths will fill a large box, which should be labeled Saturniidæ, and any boy or

girl who has a box of them may rightly feel that a beginning has been made toward a collection of Lepidoptera.

The Sphingidæ, or Hawk-moths, can boast that they have in their family some of the most graceful and most tastefully arrayed of all the Lepidoptera. A few of the Hawk-moths are small, but the greater number are large, and all have powerful wings. As a rule they fly in the twilight, and they have a habit of remaining poised over a flower while sucking the nectar. At such times, with the swift whirring of their wings, they appear quite like Humming-birds, and sometimes are mistaken for them.

No other moths present so tasteful an appearance in a collection, because of the exquisite harmony of the combined hues of ochre and brown, olive and tan, black and yellow, blending with soft grays. Their slender wings, tapering bodies and quiet, subdued colors give an impression of true refinement which their dainty habit of feeding on nectar serves to strengthen.

The sucking-tube in the Hawk-moths is very long—sometimes twice as long as the body—and when not in use is tightly coiled beneath the head. By means of their long, narrow wings, their slender, curved antennæ, their long sucking-tube and their dainty coloring, they are the most easily recognized of the moth families.

There are many species, and these differ greatly in size and color, but the Hawk-moths all have a close family resemblance, and all sip the nectar of flowers after they are grown up. As larvæ or caterpillars, however, they are great feeders, living upon the leaves of many kinds of plants. One feeds upon the leaves of the grapevine; another upon the potato; another upon the tomato, and still another upon the tobacco plant. They are nearly all large, green, naked and not at all attractive. Almost all boys and girls in the country have seen the "potato worm," but probably very few have been told that some day the

"great, green, nasty thing" will come to the garden at twilight, flitting about the shrubbery, hovering over the flowers, and drawing nectar from the blossoms through its long tube.

The caterpillars of the Hawk-moths do not spin silken cocoons, but burrow down into the earth, where they make a smooth cell by turning round and round until the shape and size just suit them. Then they go to sleep and wait until the flowers come again, when they emerge to fly away as beautiful winged creatures of the twilight hour.

Most moths fly at night or at dusk, and when at rest hold their wings flat, but there is one small family whose members fly in the daytime and have the habit of folding their wings on the abdomen in such a way as to resemble the roof of a house. Although there are only a few species, they are quite common, and may be found on almost any day in summer, resting upon shrubbery or on the grass in fields, from which they rise and fly when disturbed. Of course they are easily recognized by the way they hold their wings. Specimens can readily be secured another summer, but if there are already some in the collection, as is most likely, they should be pinned by themselves and labeled with the family name, Cymatophoridæ, which means "the wave-bearers," the name being given because these moths have beautiful wavy lines on their front wings.

There are very many other families of moths, but it would only serve to weary the children to attempt to do so much as merely mention them. It is better to become familiar with a few. There is one other family, however, that we must not overlook altogether, and as there is no more space in this lesson, we will remember to tell something about it next time, before taking up the butterflies.

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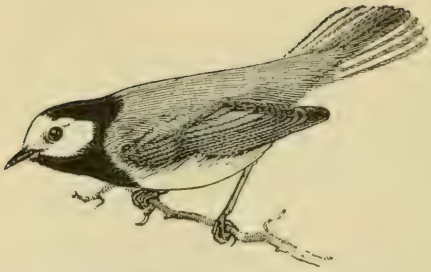

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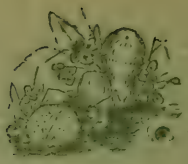

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EXPANSION IN A NEW QUARTER.

PHOTO BY E. H. FOGG.

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VOL. IV. February, 1904. No. 9.

Expansion in a New Quarter.

BY SUSY C. FOGG.

How often, after a warm dewy night in summer, there appears on the lawn, a company of mushrooms scattered among the grass and jeweled cobwebs; a kind of plant so fragile that a gentle touch will sometimes bruise, and yet again wonderfully equipped for the real, hard struggle of existence.

The epicure has found that he may continue his mushroom diet even through the winter by proper culture of certain species. So-called bricks of mushroom spawn are procured of the florist, and planted in rich beds of earth, in a warm cellar, or where an even temperature may be maintained, and unless molested by mice or unseasonable insects, all goes well, and the result is satisfactory.

But to have this growth spring up spontaneously in the cellar, in mid-winter, is unusual; moreover, to force its way to the light through a layer of concrete of ordinary depth, and which had been spread for a period of three

years, seems somewhat remarkable, though by no means unprecedented.

A hospitable neighbor allowed the passers-by to "keep tabs" on the group of mushrooms that bravely made its way to the front during the severely cold days of January; it was photographed just as it stood above the concrete in his cellar. The larger cluster appeared first and bore yet another of greater size than those which are seen in the cut; later, the second break occurred and the mushroom is seen in the button stage.

This mushroom was of the gilled variety and belonged to the Melanosporoæ or black-spored mushrooms, and I believed it to be the common genus Coprinus, though through delay in examination the species has not been ascertained. After maturity the caps partially dried and cracked open, and some of them passed into the inky liquid state so familiar to those who have gathered Coprinus. A part of the mushrooms were prepared and eaten and were said to be palatable and to possess the usual flavor of Coprinus.

Long ago, Darwin carefully demonstrated power of movement in plants, and Nature affords innumerable examples of the silent force and energy which are made manifest in the vegetable world; an invisible kind of "horse-power," that has not been bridled by the Yankee inventor for economic uses or to send him spinning through air and water with the speed of steam and electricity; but stern gravel-beds, ledges and artificial barriers are pushed aside or gradually lifted by the steady, impelling force from beneath.

Of course, we do not know how much frost action or other weathering agent may have aided in opening the first crack for the plant to wedge its tiny finger in. Some years ago, in this city, the pipe which conveyed water to a fountain on one of the main streets became clogged; little water reached the fountain, while the spring at the

other end contained an abundance. It was found, upon excavation, that the roots of the sweeping elms that lined the street had penetrated at the joints and nearly filled the pipe. The cement used to join the pipe had crumbled little by little, during the years since it was laid, and at last had given way before the vigorous impulse of the tree roots.

But the Coprinus first saw the light of day in a furnace-cellar, where cold or water do not enter, and reared its head at some distance from the stone wall. It brings to thought the firm decree that no plant or animal may choose its birthplace, and both may develop under queer environment.

The mind naturally asks these questions:—Why did this plant bear fruit in an unaccustomed season; was it forced to maturity by the artificial warmth above, or retarded some months by the tenacity of tar and gravel? Who can give an estimate of the lifting power of any growing plant?

A Winter's Walk.

BY WILLIAM H. HUSE.

It was the last Saturday of January. Storm after storm with few drifts had covered the ground nearly two feet with a crust almost hard enough to hold a man about half way down. I was after some twigs of white cedar (*Chamæcyparis sphæroidea*) that grew in a swamp a mile or more from the road. This location is perhaps the most northerly of any where this tree grows. A four-mile ride brought me to the beginning of my walk. I had thoughtlessly started out without snowshoes, and the first few rods climbing a hill with the snow up to my knees and the crust making the traveling still more wearisome, were discour-

aging, but I disliked to turn back then and so pushed on. Aside from the walking all was attractive and beautiful. The oaks, white and scarlet, still had a portion of their leaves that now and then rustled in the ghost of a breeze that passed by. Except this, all was quiet, except the scream of a blue jay that sounded afar off as I entered the wood. Soon all signs of civilization were out of sight and I might have been in some wilderness for aught I could see. On the further side of a clearing was once a lumber camp. All was gone now. The slab hut that once sheltered the choppers had been burned. It was here that a phœbe's nest was found a few years ago balanced by its bird builders on a clothes line that hung in the deserted building. Only the four posts that stood at the corners of the structure now made cones of snow that indistinctly marked its location. A track crossed the path I was following where a fox had traveled, hunting for the food that must have been scarce in the deep snow. The chirp of a chickadee on a tree near by was the most sociable thing in hearing. In a cleared place the crust was strong enough to hold my weight. For a ways I walked carefully, half sliding through the upper snow for fear of breaking the crust. Then it gave way and I was once more plowing along laboriously. Several small but steep ascents were discouraging, but I had gone too far then to turn back. One more little hill and I would be near the swamp where not only the white cedar is found but the rhododendron and at least one other plant that here grows far from other individuals of the same species. The trees were apparently doing their best to make the place cheerful. The staminate catkins of the alder showed that they were ready for the spring that seemed so far away. The hazel buds were as far advanced. The witchhazel blossoms had shed their petals but a few weeks before, and now were less conspicuous than the seed pods, a year older, that had

shot out their seeds in the fall. As the last little summit was reached, the top of a giant tupelo tree appeared not far away. The swamp was at hand. Another fox track crossed and recrossed the road; rabbit tracks mingled with them, and as the swamp was reached, the tracks of the tall, white rabbit, the delight of hunters, appeared. A few scattering cedars were found and examined. They had some cones from last year's blossoms, now dried and open but perfect. There was no need of going farther, although the larger number of trees was not yet reached. I got what I wanted and started to return. Walking back in the same tracks was a little easier, but as I approached the beginning of my tramp I had some difficulty in stepping in the tracks that I made earlier in the afternoon. They seemed far apart. Was it possible that I was getting tired? That was of little consequence now. I had found the cedar.

A Plea for Charity.

BY SUSY C. FOGG.

Report comes from far off Alaska that the present winter has been unusually mild and pleasant, but we, in New England, have been treated to all the rigors of our climate that even the oldest inhabitant can recall.

While the mercury has hovered around the zero mark and the weeds in fields and gardens have been long buried beneath the snow, I hope no one has been unmindful of the winter birds that live not by storage but by the "daily portion" alone.

Thoughtful minded individuals in the vicinity of Boston have raised subscriptions for the purpose of buying grain and other food for the birds. The snow has been cleared away in places that none of the food may be wasted and regular public feeding grounds are provided, for, it is be-

lieved that the mortality among birds has been great in the last few months.

If the bird-lover cannot give his feathered friends access to a larder of dried sunflower seeds, mountain-ash berries, seeds of weeds and grasses and coniferous trees, surely, he will not count the cost and trouble of sowing a small quantity of grain and crumbs spared from his own table.

The English sparrow will get his share, but it is not his fault that he finds himself in a land where migration seems so desirable and still is beyond his knowledge. The principle of life ordained to the small and common is the same as that of nobler birds, and the hopelessness of the fall to the ground from cold and starvation arouses the sympathy that should exist in the core of every human heart, and stimulate not so much to tearful sentiment as to giving every living creature a fair and equal chance so far as lies within our power.

The Rabbit Steals a Coat.

Here is another "nature story," formerly told by the Indians to one another and to their children, as it was translated by Mr. James Mooney and preserved in his great collection of "Myths of the Cherokee," published a short time since by the Bureau of American Ethnology:

The animals were of different sizes and wore coats of various colors and patterns. Some wore long fur and others short. Some had rings on their tails, and some had no tails at all. Some had coats of brown, others of black or yellow. They were always disputing about their good looks, so at last they agreed to hold a council to decide who had the finest coat.

They had heard a great deal about the Otter, who lived so far up the creek that he seldom came down to visit the other animals. It was said that he had the finest coat of

all, but no one knew just what it was like, because it was a long time since anyone had seen him. They did not even know exactly where he lived—only the general direction ; but they knew he would come to the council when the word got out.

Now the Rabbit wanted the verdict for himself, so when it began to look as if it might go to the Otter he studied up a plan to cheat him out of it. He asked a few sly questions until he learned what trail the Otter would take to get to the council place. Then, without saying anything, he went on ahead and after four days' travel he met the Otter and knew him at once by his beautiful coat of soft dark-brown fur. The Otter was glad to see him and asked him where he was going. "O," said the Rabbit, "the animals sent me to bring you to the council ; because you live so far away they were afraid you mightn't know the road." The Otter thanked him, and they went on together.

They traveled all day toward the council ground, and at night the Rabbit selected the camping place, because the Otter was a stranger in that part of the country, and cut down bushes for beds and fixed everything in good shape. The next morning they started on again. In the afternoon the Rabbit began to pick up wood and bark as they went along and to load it on his back. When the Otter asked what this was for the Rabbit said it was that they might be warm and comfortable at night. After a while, when it was near sunset, they stopped and made their camp.

When supper was over the Rabbit got a stick and shaved it down to a paddle. The Otter wondered and asked again what that was for.

"I have good dreams when I sleep with a paddle under my head," said the Rabbit.

When the paddle was finished the Rabbit began to cut

away the bushes so as to make a clean trail down to the river. The Otter wondered more and more and wanted to know what this meant.

Said the Rabbit, "This place is called The Place Where it Rains Fire. Sometimes it rains fire here, and the sky looks a little that way to-night. You go to sleep and I'll sit up and watch, and if the fire does come, as soon as you hear me shout, you run and jump into the river. Better hang your coat on a limb over there, so it won't get burnt."

The Otter did as he was told, and they both doubled up to go to sleep, but the Rabbit kept awake. After a while the fire burned down to red coals. The Rabbit called, but the Otter was fast asleep and made no answer. In a little while he called again, but the Otter never stirred. Then the Rabbit filled the paddle with hot coals and threw them up into the air and shouted, "It's raining fire! It's raining fire!"

The hot coals fell all around the Otter and he jumped up. "To the water!" cried the Rabbit, and the Otter ran and jumped into the river, and he has lived in the water ever since.

The Rabbit took the Otter's coat and put it on, leaving his own instead, and went on to the council. All the animals were there, every one looking out for the Otter. At last they saw him in the distance, and they said one to the other, "The Otter is coming!" and sent one of the small animals to show him the best seat. They were all glad to see him and went up in turn to welcome him, but the Otter kept his head down, with one paw over his face. They wondered that he was so bashful, until the Bear came up and pulled the paw away, and there was the Rabbit with his split nose. He sprang up and started to run, when the Bear struck at him and pulled his tail off, but the Rabbit was too quick for them and got away.

Ants and Their Slaves.

BY EDWARD J. BURNHAM.

One summer day, about one hundred years ago, Pierre Huber, a young Swiss naturalist, while walking in a field near Geneva, saw on the ground a column of reddish-brown ants, evidently on the march. Pierre, being already a trained observer, for he had from childhood used his eyes to aid his blind father, who was a naturalist also, of course carefully followed them.

He observed, as anyone may sometimes see, that while the main body marched steadily forward, there were a few on the sides of the line who constantly hurried backward and forward, as if to keep the army in order and to direct its course.

After marching about a quarter of an hour, they halted before an ant-hill belonging to some small black ants. A battle followed, for a part of the black colony made a brave resistance, while the rest hurried away with their children. Pierre soon perceived that it was these children that the larger reddish-brown ants had come for.

Ants, when hatched, are legless white grubs. After a time these grubs spin a silken cocoon around themselves and wait for the next change, when they come forth full-grown ants. These long, round, white cocoons are found in every ants' nest, and are commonly mistaken for eggs, because few people stop to think how small the eggs of such tiny creatures must be.

It was to seize and carry away these cocoons, each with a living little black ant in it, that the big red ants had come so far. The black ants knew it, and did the best they could to defend and hide their children. But the red ants were the stronger, and soon the line was re-formed and the homeward march resumed, each soldier

carrying off in its jaws a baby black ant wrapped up in its silk blanket.

Pierre Huber was greatly excited, as well he might be, for no one had ever before seen such doings in the insect world. He left the black ants to mourn their loss and repair the damage as best they might, and followed the robbers to their own castle. Here he was still more surprised, for at the entrance a small population of black ants came forward to receive and take charge of the plunder, evidently delighted with the accession of these children of their own race.

Young Huber at once entered on a series of careful observations of this new feature of ant life, and soon found that the black ants were slaves and did the work of the colony. They not only built and excavated galleries and chambers, but they brought up the young red ants and the captives of their own species. They also administered the affairs of the community, provided the supplies of food, waited upon their red masters, and even fed them.

Huber tried an experiment. He was desirous of observing what would be the result if the big red ants found themselves without servants, and whether they would know how to supply their own wants. He put a few into a glass case, and with them some cocoons. At first they began instinctively to move these about and to cradle them in something of the fashion that other ants do; but they soon tired of the work, apparently found the cocoons too heavy, and coolly abandoned them. In fact, they also abandoned themselves. Huber put some honey for them in a corner, so that they had nothing to do but take it. They did not touch it; they seemed to know nothing; they and their ancestors had been attended, cared for and even fed so long that they did not even know how to feed themselves. Some of them died from starvation with food before them.

Huber, to complete the experiment, then introduced into the case one black ant. Its presence changed the whole face of things. It went straight to the honey and proceeded to feed the helpless and starving giants. It dug a hole in the ground, and put the cocoons in it and placed them favorably for further development. The red ants were soon on their feet again, strong and vigorous, and quite likely the black ant would have been delighted to have them go on the warpath and take more prisoners, since that was the only thing they knew how to do.

It will be understood, of course, that this was a European species of ant which Pierre Huber studied and afterwards wrote about. There are slave-holding ants in this country, but they work in company with their slaves, and have not given up the control of affairs. They are not only abundantly able to feed themselves, but they plan the work for the community and see that the little blacks help to carry out the plans. Perhaps sometime I will tell about a colony of slave-holding ants that I had the good fortune to be able to watch one summer, right here in New England, but for now we must go back to Pierre Huber and his slave-holding ants in Switzerland.

The discoveries he had made were so new and strange that he could scarcely credit them himself, and he did not at all expect other people to believe them. So he sent for M. Jurine, one of the greatest naturalists in Sweden, to come and go through the investigation with him. M. Jurine, and afterward others who pursued the same course of experiments, found that the young naturalist's observations were entirely correct.

Jules Michelet has told us that when he first read Pierre Huber's published account of his investigations, he threw the book down in disgust. He did not want to believe it. He knew there were slavery and slave-hunting in the world, but he wanted to think that only human beings

were guilty; he was shocked that in nature also things could be so out of joint. He finally read the book, of course, as any fair-minded man would under similar circumstances, but still cherished the hope there might be some mistake. Then—as if to illustrate the well-known truth that we are most likely to see that to which our attention has been called, even though we have passed it by a hundred times—he went to take a walk and saw the very thing that he had doubted. His description, in his own peculiar style, is worthy of reproduction at the close of this account of Pierre Huber's discovery of ants that keep slaves. It will be noticed that he or his translator confounded "eggs" and "nymphs" with pupæ, just as many people are apt to do nowadays. Here is the great historian's account of the episode:

"But on a certain occasion I saw it—with my own eyes saw it—in the park of Fontainebleau. I was accompanied by an illustrious philosopher, an excellent observer, and he too saw exactly what I saw.

"It was half-past four in the afternoon of a very warm day. From a pile of stones emerged a column of from four to five hundred red or reddish ants, precisely the same colour as the wing-cases of the gnat. They marched rapidly towards a piece of turf, kept in order by their sergeants or "pivot-men," whom we saw on the flanks, and who would not permit any one to straggle. (This is a circumstance known to everybody who has seen a file of ants on the march.) But the novel and astonishing thing to me was, that gradually those who were at the head drew near to each other, and advanced only by turning; they passed and repassed the whirling crowd, describing concentric circles; a manœuvre evidently fit to produce enthusiasm, and to augment energy—each, by contact, electrifying himself with the ardour of all.

"Suddenly the revolving mass seemed to sink and dis-

appear. There was no sign of ant-hills in the turf; but after a while we detected an almost imperceptible orifice, through which we saw them vanish in less time than it takes me to write these words. We asked ourselves if it was an entrance to their domicile; if they had re-entered their city. In a minute at the utmost they gave us a reply, and showed us our mistake. They issued in a throng, each carrying a nymph on its mandibles.

"From the short time they had taken, it was evident that they had a previous knowledge of the localities, the place where the eggs were deposited, the time when they were to assemble, and the degree of resistance they had to expect. Perhaps it was not their first journey.

"The little blacks on whom the red ants made this *razzia* sallied out in considerable numbers; and I truly pitied them. They did not attempt to fight. They seemed frightened and stunned. They only endeavored to delay the ravishers by clinging to them. A red ant was thus arrested; but another red one, who was free, relieved him of his burden, and thereupon the black ant relaxed his grasp. In fine, it was a pitiful scene for the blacks. They offered no serious resistance. The five hundred red ants succeeded in carrying off nearly three hundred children. At two or three feet from the hole, the blacks ceased to pursue them, abandoned all hope, and resigned themselves to their fate. All this did not occupy ten minutes between the departure and the return. The two parties were very unequal. It was evidently a facile abuse of strength—very probably an outrage often repeated—a tyranny of the great, who levied a tribute of children from their poor little neighbors."

Nature Study Lessons. XXI.

BY EDWARD J. BURNHAM.

While nature study ought to tend to the development of sentiments of kindness and mercy toward all living creatures, it is nevertheless desirable that children be taught to be sensible as well as sentimental. No insect, for example, should ever be tortured—sticky flypaper is a cruel abomination—and yet it is necessary that vast multitudes of the insect tribe should be destroyed. Good food in abundance is of more importance than the lives of many insects.

It happens that nearly all Lepidoptera are destructive to vegetation. Many of them, as caterpillars, feed upon the growing crops of the farmer, the fruits of the orchard and the vegetables of the garden. Each female lays many eggs, and it happens, therefore, that commonly when a moth or butterfly is killed a good service is rendered to one's fellowmen. Food would be much more abundant and more easily obtained by all—especially by the very poor in the large cities, if many of the families of the Lepidoptera were utterly destroyed. So the children should not be taught that it is cruel to make a collection, unless the catching and killing are cruelly done.

As moths fly mostly by night, it would be difficult making a collection of them if it were not that many species are attracted to lights, while many other species are exceedingly fond of sweets. A light in the window, or on the veranda, on any summer evening, will be sure to bring numerous individuals of several species within easy range of the net. Since moths, as a rule, have their special seasons, each succeeding week will bring new species, and the collection will grow with wonderful rapidity and increasing interest throughout the summer.

"Sugaring" is the term applied to the art of catching moths by means of the exposure of some form of liquid sweets in places where those that commonly sip nectar may be attracted to them. It is for beginners one of the most interesting incidents of entomological study, but unfortunately sugaring can only be practiced in the evening, when the younger of the young people, at least, ought to be in bed. Moreover, the best places for sugaring are along the margins of woods and the borders of thickets, which are not usually near the home. Something can be done, however, in the garden, in the orchard, and beside the highway, at a distance easily covered in fifteen-minute rounds from the veranda where the light is attracting those moths that come foolishly fluttering around it.

The ideal place for catching moths by lights and by sugaring is a camp beside a stream in the edge of a forest. This, of course, is not practicable for every one, but there is a charm about the scene—the peaceful summer evening, the fluttering of new arrivals about the light, the uncertainties and surprises of the sugaring—that no child, or grown person either, should miss, if arrangements can possibly be made for a camping excursion during vacation time.

The best mixture for sugaring is a material of rum and molasses. This should be smeared with a brush, a swab made by tying a rag round a stick, or a small bough of hemlock or fir, upon the smooth trunks of gray or dark-colored trees and upon old, unpainted fences. Moths, being commonly of some subdued shade of color, will rarely expose themselves upon the white bark of a birch or upon the light-colored wood of new boards.

The objects upon which the "sugar" is placed may be selected so as to form a circle or other convenient figure, beginning and ending at the camp, or the veranda. Then, once in about fifteen minutes, a tour must be made to look

for results. Two should go together when convenient, one carrying a light and the other the insect net. Many species that would otherwise rarely be found may be secured in this way, and the garden and roadside are not altogether unpromising, if it is out of the question to go to the woods.

The most beautiful of the moths that are commonly taken by means of sugaring are the Catocalas, or Underwings, which belong to the great family of the Noctuidæ, or Owlet moths. There are many interesting moths among the Noctuids, but no others that equal the Underwings in the tastefulness of their dress and the daintiness of their manners.

The Catocalas are moths of large size, often expanding three inches from tip to tip of wing. The fore wings are usually brown or gray, and are marked with wavy or zigzag lines. These large soft-gray wings of course cover the hind wings when at rest, and afford the Catocalas very effective protection from their enemies, as they rest upon the dull-colored bark of the oak and other forest trees upon which its larvæ feed. Very sharp eyes will often overlook them when at rest. It is only when they rise and fly that the beautiful hind or under-wings are seen. The ground color of these wings is black, but they are crossed with broad bands of red, yellow, or white, according to the species. These bands are in reality recognition marks, like the uniforms and insignia of soldiers, by which they may distinguish the individuals of their own kind from those of other species, and they are often very beautiful as one catches a glimpse of them by aid of the light of lantern or lamp as they rise to fly away.

These handsome moths, which the English people named "Underwings" ever so long ago, and which have similar names in many other languages, are as dainty in their feeding as they are tasteful in their dress. Many other moths

will fly greedily at the patch of rum and molasses, or sugar syrup, and, unless this has been spread very thin and very carefully, will not only stick fast in it, but will so besmear themselves as to be useless as specimens in a collection. It is not uncommon, in going the rounds of the sugared trees, to find numbers of moths thus perishing miserably through their blind heedlessness and greed.

But it is not so with the Underwings. They are as fond of rum and molasses as are their greedy cousins of the great Owlet family, but they have more self-control. A Catocala, or Underwing, will fly a long way, attracted by the strong odor of the rum, but when she reaches the tree upon which the tempting liquid has been placed, she proceeds with great circumspection. In the first place, if it is a white birch or other nearly white tree, she will not alight at all, as I have satisfied myself after many experiments. Much as she loves sweets, she will not take risks in gratifiying her appetite. If the color of the tree is of about the same shade as her dress, however, she will approach cautiously and alight near the tempting patch, but not upon it. Then she will approach until she can reach the molasses with the tip of her long tongue, and settle down to enjoy herself in her own dainty fashion, while other moths are struggling hopelessly in what has proved for them a sea of trouble. Probably, if she thinks at all, she thinks they have made great fools of themselves.

It is not always easy to catch the Catocala, even after she has settled down to secure her fill.

For often, as the first gleam of light falls upon her, she will fly away, and all the collector will have for his trouble will be a momentary glimpse of the bright under-wings of a large, graceful moth which he feels sure is more beautiful than any moth he ever saw before.

With care, however, which one will learn in time to exercise, a few of each species will be taken sooner or later,

and a few are as satisfactory in a collection as a multitude would be. Besides, as Catocalas feed upon forest trees, and are rarely numerous, they inflict no great injury, and there is therefore a lack of the comfortable feeling, as with many of the Noctuids, that in destroying them we are protecting vegetation from their ravages. No true nature lover, I am sure, would care to kill more than a very few of the dainty and beautiful Underwings. Those that he does capture, should be carefully expanded and pinned in the box labeled with the family name, Noctuidæ.

About Swallows.

One year, far back in the last century, spring was very late in England, a fact which greatly troubled the good Mr. Broderip, the naturalist, who longed for the return of the birds and flowers. On the 28th of March he entered in his note-book, "There was thick ice yesterday on the water in St. John's Park," which was, of course, a very unusual occurrence. On this late day in March, then, Mr. Broderip first piously observed that "the winds are best in the hands of the Great Anemonologist," and after, with a heart filled with yearning for the springtime, fell to gossipping of the swallows.

"Still," he wrote, "shivering mortals may be pardoned for looking with intense anxiety for the winged herald of summer, whose advent ever has been and ever will be hailed by man. A Greek design is now before me, representing three persons of different ages. The one on the left, a young man in the flower of youth, exclaims, as he points to the bird flying above him, "Behold a swallow!" The center figure, a man of more advanced but still vigorous age, seated, like the former, has just turned his uplifted head, saying, "True, by Hercules!" and at the same moment a boy, standing and pointing at the same

apparition, cries, "There she is!" All this the elder person ratifies with "The spring is come!" Nearly the same exclamations flow through a line of Aristophanes.

"Speaking of the American barn swallow, Wilson says, 'We welcome their first appearance with delight, as the faithful harbingers and companions of flowery spring and ruddy summer; when, after a long, frost-bound and boisterous winter, we hear it announced that 'the swallows are come,' what a train of charming ideas are associated with the simple tidings.' The human heart was equally touched, whether it was beating in the bosom of an ancient Greek or of a modern American."

After giving considerable information relative to American swallows, martins and swifts, Mr. Broderip quotes from a letter written in 1800, by the Rev. Walter Trevelyan from Long Witton, Northumberland, to the editor of Bewick's "British Birds," in which that gentleman gives a plain and unaffected account of the taming of a swift or "chimney swallow."

"About nine weeks ago," writes the good clergyman, "a swallow fell down one of our chimneys, nearly fledged, and was able to fly in two or three days. The children desired they might try to rear him, to which I agreed, fearing the old ones would desert him; and as he was not the least shy, they succeeded without any difficulty, for he opened his mouth for flies as fast as they could supply them, and was regularly fed to a whistle. In a few days, perhaps in a week, they used to take him into the fields with them, and as each child found a fly and whistled, the little bird flew for his prey from one to another; at other times he would fly round about them in the air, but always descended at the first call, in spite of the constant endeavors of the wild swallows to seduce him away; for which purpose several of them at once would fly about him in all directions, striving to drive him away when they saw him about to settle on one of the children's hands, extended with the food. He would very often alight on the children, uncalled, when they were walking several fields distant from home.

"Our little inmate was never made a prisoner by being

put into a cage, but always ranged about the room at large wherever the children were, and they never went out of doors without taking him with them. Sometimes he would sit on their hands or heads and catch flies for himself, which he soon did with dexterity. At length, finding it take too much of their time to supply him with food enough to satisfy his appetite (for I have no doubt he ate from seven hundred to a thousand flies a day), they used to turn him out of the house, shutting the window to prevent his return, for two or three hours together, in hopes that he would learn to cater for himself, which he soon did; but still was no less tame, always answering their call, and coming in to the window to them, of his own accord, frequently every day, and always roosting in their room, which he has done regularly from the first till within a week or ten days past. He constantly roosted on one of the children's heads till their bedtime; nor was he disturbed by the child moving about, or even walking, but would remain perfectly quiet with his head under his wing, till he was put away for the night in some warm corner, for he liked much warmth."

The kind and considerate attempt to alienate the attached bird from its little friends had its effect. Mr. Trevelyan concludes:

"It is now four days since he came in to roost in the house, and though he did not then show any symptoms of shyness, yet he is evidently becoming less tame, as the whistle will not now bring him to the hand; nor does he visit us as formerly, but he always acknowledges it when within hearing by a chirp and by flying near. Nothing could exceed his tameness for about six weeks; and I have no doubt it would have continued the same had we not left him to himself as much as we could, fearing he would be so perfectly domesticated that he would be left behind at migration, and of course be starved in the winter from cold and hunger."

To this letter Mr. Broderip adds: "And so ends this agreeable story; not, however, that it was 'of course' that the confiding bird would be starved if it remained; for the Rev. W. F. Cornish, of Totness, kept two tame swallows, one for a year and a half, and the other for two years, as he informed Mr. Yarrell."

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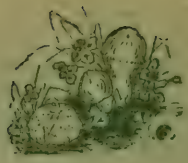

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THE SWAMP WHITE CEDAR.

PHOTO BY W. H. HUSE.

NATURE STUDY.

PUBLISHED UNDER THE AUSPICES OF THE

Manchester Institute of Arts and Sciences.

VOL. IV. March, 1904. No. 10.

A Point of Honor.

BY FREDERICK W. BATCHELDER.

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GARDEN

The hard winter walk described in the February number of NATURE STUDY was truly a labor of love. Only a true lover of nature and of his kind would have undertaken it. The immediate impelling motive was the solicitation of a friend who was temporarily disqualified from performing the task. Aside from that, the honor of Manchester and of the Institute were at stake, to say nothing of the local botanists.

It is nearly ten years since first I visited, in company with a friend of like mind, the remarkable locality in the extreme northwest corner of Manchester known as the "rhododendron swamp." This local station of Rhododendron maximum is very difficult of access, being a high, wet swamp which occupies an extensive depression between rocky and barren hills, the whole locality being, it is said, so destitute of money value as not even to appear on the assessors' books. The time of our visit was

evidence offered by photography. That is what we offer them in our frontispiece. If they are not satisfied with that we will send them pressed specimens on demand. Two photographs were taken; one of a small branch and one of a branchlet. The former was the more artistic and beautiful, and showed the exquisite curve taken by the drooping spray at the ends of the branches, especially at the top of the tree; the other was adopted for the illustration as better showing the characteristic cones and leaves, possibly even the little tubercles on the flat leaves may be made out with a pocket lens.

Be it known, then, that this station of the swamp white cedar is in Hillsborough County, N. H., about 25 miles north of the Massachusetts line and nearly 50 miles west from the New Hampshire seacoast. Compilers of lists and manuals will please take due notice hereof and govern themselves accordingly.

There is said to be a rhododendron swamp also in Hopkinton, several miles further north. Will not some observer in that vicinity institute a search there for the swamp cedar also? The ecological conditions being in all probability very similar to those in the Manchester swamp it would not be surprising if the tree in question should be in hiding there also.

The swamp white cedar in its native home is the handsomest of our cedars. It is described by Dame and Brooks as "forming a conical head, often of great elegance and lightness." These authorities also say, "it is valued chiefly in landscape planting for covering low and boggy places where other trees do not succeed so well."

The other cedars growing wild in New Hampshire are the arbor vitæ (*Thuja occidentalis*) and the red cedar (*Juniperus Virginiana*). The arbor vitae is common in swamps north of the White Mountains, but rare to the south of them. It is largely employed, as everyone knows,

in landscape planting and for hedges and borders. The red cedar is common, though not so abundant in the vicinity of Manchester as farther east and south. There is another juniper which sometimes grows to the size of a tree, concerning which I hope to have an article in the near future.

The cedars form a well marked tribe of the pine family. They are distinguished from the pine (or fir) tribe by the small size of the leaves and cones. The leaves in all of them are mostly appressed, i. e., closely adherent to the branchlets, and the cones are very small, being usually less than half an inch in length. The three cedar trees named are perfectly distinguished by their cones. The cones of the arbor vitæ are bud-shaped and have from six to twelve loose scales, which at maturity open to the base. Those of the swamp white cedar are globular in form, of few shield-shaped woody scales, each scale with a spur-like projection on the back, and at maturity the scales open toward the centre, never to the base. Finally, those of the red cedar are berry-like, from the coalescence of the fleshy scales, about the size of a small pea and in color dark blue with a whitish bloom.

Can we conceive what humanity would be if it did not know the flowers? If these did not exist, if they had all been hidden from our gaze, as are probably a thousand no less fairy sights which are all around us but invisible to our eyes, would our character, our faculties, our sense of the beautiful, our aptitude for happiness be quite the same? All of a delightful sense would sleep forever at the bottom of our harder and more desert hearts and our imagination be stripped of worshipful images. The infinite world of colors and shades would have been incompletely revealed to us by a few rents in the sky. The miraculous harmonies of light at play, ceaselessly inventing new gayeties, reveling in itself, would be unknown to us, for the flowers first broke up the prism and made the most subtle portion of our sight.—*Maeterlinck, in the February Magazine Number of the Outlook.*

Some Abrasives.

BY WILLIAM H. HUSE.

A class of stones, of interest because of their commercial value, is the group used as abrasives. These stones are necessarily hard in order to abrade, and must also be more or less coarse grained that the surface of the abrasive may wear away and not become glazed. It has been the privilege of the writer to recently examine specimens from the Pike Manufacturing Company of Pike, N. H., and these will be briefly described.

The coarsest grained is a sandstone from Indiana, near Orleans. While coarse grained as a whetstone it is not the coarsest variety of sandstone. It is colored a light grayish-brown by a small quantity of oxide of iron. It is so much used by the shoe trade that it is often called "shoemakers' sandstone." It is also used in the kitchen for sharpening the common knives used there.

Hindostan is the name of a very fine grained sandstone, also from Indiana, a little lighter than the first named, and rather soft. This is efficient as a cheap stone for general purposes.

Washita is a quartzite from Hot Springs, Arkansas, quite fine grained and nearly white in color, some brands quite so. One variety is streaked with reddish and receives a commercial name descriptive of its color. This stone is used to sharpen general woodworking tools.

Arkansas stone is chemically the same as the last named but is much finer grained. It is perhaps the hardest and finest grained sharpening stone that is used in its natural state. This is known to the mineralogist as novaculite, and as the student in mineral determination uses it to find the streak of the specimen he is studying he calls his novaculite whetstone a "streakstone." This mineral is found

in a ridge 250 feet high beside the Hot Spring valley and is described by Dr. D. D. Owen as "equal in whiteness, closeness of texture, and subdued waxy lustre, to the most compact forms and whitest varieties of Carrara marble. Yet it belongs to the age of the millstone grit." It is supposed to have received its impalpable fineness through the action of hot water on sandstone.

Queer Creek is the name given to a fine, gray sandstone from Ohio. This is hard as a sandstone and is used for about the same purposes as the Washita though it is somewhat softer than the latter. Its market value is less, as it is a cheap grade of stone.

From Lisbon, N. H., comes a whetstone of very fine mica schist or micaceous shale containing fine crystals of garnet or rutile. These crystals give it its abrasive qualities, in which it ranks high. It is regarded by those who quarry and prepare it as the best stone for general purposes in the market. It is given the commercial name of Chocolate.

At Pike, N. H., is quarried a scythe stone known as Indian Pond. This is a fine grained mica schist, the small particles of quartz giving it rapid sharpening power. This stone is probably the best known scythe stone in the United States. It has been on the market since 1823.

Feeding the Birds.

A duty that every subscriber to NATURE STUDY and every lover of nature owes to our feathered friends is the providing of a lunch on these cold days. Comparatively few of the seed eating birds come near enough to our dwellings to profit by our generosity, and grain thrown out will be eaten mainly by English sparrows, but this would not be objectionable to the champions of these noisy neighbors of ours. A beef bone or a piece of suet tied in a tree

proves a welcome feast for the smaller birds that remain with us and live upon the minute insects and still smaller eggs that are concealed in the crevices of bark. Woodpeckers will leave their tapping for worms and peck for a while at the suspended suet; nuthatches will make regular excursions to the outdoor lunch room and greedily help themselves; while the little chickadee, dearest of all the birds, will gratefully use it to replenish his scanty larder.

Did you ever notice the difference between the pecking of a chickadee and that of a nuthatch? The former swings his head only; the latter, accustomed to hammering in harder material, works his whole body. The force of habit is strong in the so-called lower animals as well as in the movements of us superior beings. Several pieces of suet in a tree in the yard of the writer are daily visited by the birds just mentioned as well as the neighboring sparrows that are in the tree almost continually. More than once chickadees, woodpeckers and nuthatches have been seen in the tree at the same time feeding at the different places.

It is not too late now to begin and put a lunch for the birds in a tree. If it is in sight of your window you will be repaid many times over for your trouble before the winter is over.

They [the flowers] have accumulated within us, since our childhood, and even before in the soul of our fathers, an immense treasure, the nearest to our joys, upon which we draw each time that we wish to make more real the clement minutes of our life. They have created and spread in our world of sentiment the fragrant atmosphere in which love delights. That is why I love, above all, the simplest, the common-est, the oldest and most antiquated; those which have a long human past behind them, a long array of kind and consoling actions; those which have lived with us for hundreds of years and which form part of ourselves, since they reflect something of their grace and the joy of life in the soul of our ancestors.—*Macterlinck, in the Outlook.*

The Story of Pike.

BY UNCLE NED.

CHAPTER I.

Pike's mother was a pickerel, and so, of course, Pike was a pickerel, too.

One day late in spring, when the water of the lake was getting to be warmer and warmer beneath the bright sun, Pike's mother went a little way up a brook which came down to the lake from the hills beyond. She was very beautiful. Her dress was of the pattern that she wore the year round, but the colors were much brighter. The zig-zag lines on her sides were like black satin; the yellow bands between the lines were like gold; the white beneath was like shining silver. Her fins were tinged with red; her gill-covers, as they opened and closed with her breathing, showed the colors of the rainbow; her eyes shone, and there were bright yellow rings around them.

She found a patch of sand, which the brook had brought down and spread out where the water was still and shallow. She made a hollow in the sand, turning round and round upon it. In the hollow she placed many thousands of tiny yellowish-white eggs, and went away and left them. There were not fewer than ten thousand of these eggs; there may have been twenty thousand. Nearly all were in large, sticky masses, but a few became separated and rolled apart on the sand.

By and by, a shoal of minnows came that way, poking the masses of eggs about and eating some of them. But the minnows were small, and could not eat a large quantity; besides, they were not very hungry, because in the spring-time there is always an abundance of other food in the water, which fishes can have for the taking.

Before night, a water-tiger came along, sometimes swimming, and sometimes crawling about in the mud and sand. A water-tiger is almost always hungry, for he grows fast, and the faster he grows the hungrier he is. He was a long, lean, savage fellow, with six legs and a big pair of jaws. He found the eggs, and ate all he could of them. He ate so many that for once in his life he was not hungry; so he found a snug place under the bank, curled up and went to sleep. When he awoke, he was not a water-tiger, but a big, shiny black beetle. Such a change happens very often in the water, and the people who live there think nothing of it.

At dusk, some horn-pouts came up the brook from the lake, trying, with their slender "feelers," to find something good to eat. The water was so shallow over the sand that the big horn-pouts did not try to go there, but the little ones found the eggs, and had a great treat. They ate nearly all the eggs that were still clinging together in masses, but as they greedily crowded and pushed one another about, they accidentally covered some of the eggs with sand and lost them.

Pike began to grow in one of these eggs. It had been a narrow escape for him, but he had narrow escapes nearly every day of his life. It is the way with creatures that live in the water. At first, there came to be a thin, narrow, black streak in the egg. In about five days, the streak began to look as if it was going to be *something*, but it did not look at all like a fish. In two days more, Pike's heart began to beat, and it kept on beating until one fine day many years after. Two pairs of fins began to grow very fast.

In twelve days, Pike was hatched. He wriggled his way out of the sand, and rose to the surface. He now looked like some kind of a fish, but not like a pickerel. His head was large and round, and his fins were big and

awkward. He looked as if he were nearly all head and fins, with a very slender body indeed.

Clinging to the under side of this slender body, was the yolk of the egg from which Pike was hatched. At first, Pike lived entirely on this yolk, taking it into his body through his thin skin. Every day the yolk became smaller, and every day Pike grew larger. His head lengthened into a snout, like a pickerel's; his body thickened; his fins seemed less clumsy and ridiculous. In seven days after he was hatched, the yolk had disappeared, and Pike had changed to a pretty little pickerel.

Soon after he was hatched, Pike made a great discovery. He found that by moving his tail quickly from side to side, he could make himself go forward. Afterwards, he found that by giving his tail a different sort of twist, he could go backward, too; but at first he only went forward. It was great fun to go round and round in the still water.

But just when he had begun to enjoy himself, a dreadful thing happened, which taught him that too much fun may not be good, even for little pickerel. One of his sisters, who had been hatched a little later than himself, was just beginning to swim about, when a bug, called a water-boatman, came along, speared her right through the body with his long, sharp beak, and carried her away.

Pike's eyes were always wide open; indeed, he had no way to shut them, and it was better so, for fish have many enemies. Pike could learn some things quickly. So, when he saw his sister carried away, wriggling helplessly on that cruel beak, he left off swimming about for fun, and swam in real earnest for a big, flat lily-pad, under which he stayed until the egg-yolk, on which he had lived ever since he was hatched, was all gone.

Pike was eight days old when, for the first time in his life he felt hungry. It was plain that he must now depend upon himself, and catch something to eat or starve

to death. He came out to the edge of the lily-pad and watched.

Presently, a very small black beetle came swimming along in a great hurry. It was a kind of water-beetle that is always in a hurry, except when it is clinging to a twig or plant, where it is not likely to be seen. It was a harmless little beetle, which was not at all to blame because the bug had carried off Pike's sister; but Pike did not care for that. He was hungry, and the beetle looked good enough to eat. So he turned toward it, balanced himself with his fins, gave some sharp strokes with his tail, and darted at the beetle. He caught it in his jaws, and went back to the lily-pad. The beetle, though small, was bigger than Pike's mouth; but Pike flattened his head and spread his jaws, as bigger pickerel do, and crunched and crunched, until the beetle was fit to swallow.

This was Pike's first dinner, and although the beetle was small, it was quite enough for so little a fish, and Pike, contented, stayed under his lilly-pad and kept on growing.

The bottom of the sea near the shore and in shallow inlets can be better seen from a moderate height, as from a balloon, than from the surface. It is proposed by a French engineer to make use of captive balloons to chart by observation and photography dangerous waters, making the observations more accurate by soundings.

One of the grants of the Carnegie Institution is the sum of $2,500 for investigating the flow of rocks. This work has been taken up by the McGill University of Montreal. Under a pressure of 120 tons, marble, limestone and even granite show the phenomena of flow, though of course very slowly.

Another Case of Expansion.

BY SUSY C. FOGG.

There was published in *Current Literature* for April, 1899, an extract taken from the *Philadelphia Press* on the "Amazing Lifting Power of Plants."

If the reader found anything of interest in the mushroom sketch contained in the last issue of NATURE STUDY, he will not fail to scan the following worthier article.

There is no one less given to dreaming and exaggeration than the true scientist; scientific research demands accuracy of observation and measurements, and the truth wherever it may be fathomed; therefore, while the average lifting power of a man possessed of healthy muscles may not exceed 150 or 175 pounds, yet, this astonishing estimate of the plant may be received with assurance, coming as it does from one of our leading agricultural colleges.

Experiments have demonstrated that one of the most amazing things in nature is the lifting power possessed by a growing plant. Science has proved that such an insignificant, commonplace vegetable as a squash is capable of elevating a 5,000-pound weight by the mere force of its resistless living power of expansion. Given the requisite number of these products of nature and the squash could elevate a modern sky-scraper or rend a rock.

Experiments to show the marvelous force latent in the vegetable world have been conducted by Charles H. Ames at the Massachusetts Agricultural College, Amherst. The attention of the president of the college, W. S. Clark, was directed to the matter, and he, together with other gentlemen interested in opening up new pathways to knowledge, made further experiments. A squash was procured and a harness constructed on such principles as

would enable the plant to exert to the utmost its lifting powers. In describing the preliminary experiments and the theories on which they based their plans, Mr. Clark says:

"The following considerations suggested the idea: First—It is a well known fact that beans, acorns and other seeds often lift comparatively heavy masses of earth in forcing their way up to the light in the process of germination. Secondly—We have all heard how common mushrooms have displaced flagging stones many years since in Batingstoke, and more recently in Worcester, England. In the latter case, only a few weeks ago, a gentleman, noticing that a stone in a walk near his residence had been disturbed, went for the police, under the impression that burglars were preparing some plot against him. Upon turning up the stone, which weighed eighty pounds, the rogues were discovered in the shape of three giant mushrooms. Thirdly—Bricks and stones are often displaced by the growth of the roots of shade trees in streets. Cellar and other walls are also frequently injured in a similar way. Fourthly—There is a common belief that the growing roots of trees frequently rend asunder rocks, on which they stand, by penetrating and expanding within their crevices.

"Having never heard of any attempt to measure the expansive force of a growing plant, we determined to experiment in this direction. At first we thought of trying the expansive force of some small, hard, green fruit, such as a hickory nut or a pear, but the expansion was so slow and the attachment of the fruit to the tree so fragile that the idea was abandoned. The squash, growing on the ground, with great rapidity and to an enormous size, seemed, on the whole, the best fruit for the experiment.

"Accordingly, seeds of the mammoth yellow Chili having been obtained, they were planted in the propagating

pits of a plant-house, where the temperature and moisture could be easily controlled. A rich bed of compost from a spent hotbed was prepared, which was four feet wide, fifty feet long, and about six inches in depth. Here, under the fostering care of Professor Maynard, the seeds germinated, the vine grew vigorously, and the squash lifted in a most satisfactory manner. The experiment was watched day and night by relays of the scientists interested. An ingeniously constructed apparatus for testing the lifting power of the plant consisted of a frame of seven-inch boards. In this framework the harnessed squash was deposited, the harness consisting of iron straps completely encircling the squash. To the harness was attached a lever on which were placed the weights to measure the lifting capacity of the vegetable. As the growing squash elevated the weights, others were added.

"A careful record kept shows that the lifting done was as follows:

	Pounds.
Twenty-first of the month	60
Twenty-second of the month	69
Twenty-third of the month	91
Twenty-fourth of the month	162
Twenty-fifth of the month	225
Twenty-sixth of the month	277
Twenty-seventh of the month	356
Thirty-first of the month	500
Eleventh of next month	1,100
Thirteenth of next month	1,200
Fourteenth of next month	1,300
Fifteenth of next month	1,400
Twenty-seventh of next month	1,600
Thirtieth of next month	2,015
Third of third month	2,115
Twelfth of third month	2,500
Eighteenth of third month	3,120
Twenty-fourth of third month	4,120
Thirty-first of third month	5,000

"When the squash had lifted this amazing weight the harness gave way under the great pressure, and it had to be removed. The result, however, proved that what have been regarded as fairy tales were actual facts; that a growing plant can lift a tree, split asunder the solid granite and move masses in a manner that prior to these experiments may well have been deemed incredible."

The Bluebird in Kentucky.

BY STEPHEN D. PARRISH.

"De bluebird's done come! I hearn em singin' in de trees," exclaimed Aunt Dinah this morning as she came to our residence to "git de white folks' brekfas."

In Kentucky folklore the early arrival of the bluebird (*Sialia sialis*) is a sure harbinger of approaching spring, and its appearance is not only welcome to the negro but to all—especially at the ending of a long, hard winter, as this one has been. We put Aunt Dinah's emotions into words thus:

De snow-ice in de sunshine do glitter,
  And de biling spring-branch runs free,
While we lis'en to de Souh'-lan' song
  Of de bluebird in de tree.

Our souls am filled wid gladness,
  As de sines of spring-time we see's,
And singin'ly we niggies welcome
  De brave bluebirds in de trees.

This bird does not now as formerly in Kentucky, at least near the towns and villages, breed so profusely on account of the persecutions of the English sparrow.

One of the most serious charges that is brought against the English sparrow is the forceful usurpation of the door-yard homes of the brave, little, gentle and highly useful bluebirds.

Richmond, Ky.

The Pantheist.

BY CHARLES H. OAKES.

The mysteries of life 'round me,
  Are more than I can meet;
Men know what lies beyond the skies,
  But not what laps their feet.

I cannot lift mine eyes so high;
  Low to the Earth I bow;
A mossy mass, the birds that pass,
  Fret furrows in my brow.

My soul to Thee is ever tuned,
  Strung to the zephyr's play;
And dales and hills, and trees and rills,
  Are netted in the lay.

O Nature!—mother, nurse and wife—
  Whom, living, I have wed;
Amid thy charms, in thy strong arms,
  I'll sleep when I am dead.

Nature Study Lessons. XXII.

BY EDWARD J. BURNHAM.

Spring has come again. Already not a few insects have made their appearance, and we have not completed the arrangement of the collection that we made last year. Perhaps it is just as well.

Entomology is a science not to be mastered in a year or in a lifetime. We have learned to recognize the different orders of insects, and in our walks this season we shall have no difficulty in distinguishing the beetles from the bugs, the grasshoppers and crickets from the moths and butterflies, the flies from the bees, and the may-flies from the dragon-flies, and most of the queer members of the order Neuroptera from all the other kinds of insects that we shall see.

The knowledge will stay with us all our lives. It has cost us nothing more than a little close attention, careful observation and an occasional romp in the open air, all of which was of real value to us as the very best exercise for mind and body. It will add to the pleasure of every walk abroad and increase the sum of happiness we find in the world, which we shall learn sooner or later is made up chiefly of seemingly little things.

Having learned that butterflies differ from moths in having clubbed antennæ, in flying only by day, and in holding their wings upright when at rest, we may next learn to distinguish at least a few of the smaller groups, or families.

Nearly every child knows the swallow-tails, and knows, too, that they are commonly among the first butterflies to make their appearance in spring. The Tiger Swallow-tail has yellow wings with a broad black border in which there is a row of yellow spots. The fore wings are crossed with four black bars. The Black Swallow-tail has black wings, crossed with two rows of yellow spots. There is also a row of small yellow spots on the border of the wings that are shaped like new moons. These spots, being placed on the margin of the wings and crescent-shaped, are called marginal lunules.

These butterflies—the Black and the Yellow Swallow-tails—are found nearly all over the United States. They, and all other butterflies and moths, should be pinned soon after they have been killed, and their wings should be spread on a grooved board, or with the body placed between two books lying near together, side by side, the wings being held flat by some light weight. When dry, the wings will remain as they have been "set," and the insects may then be pinned in boxes. The swallow-tails should be marked with the name of their family, Papilionidæ.

The most abundant butterflies, those which are to be seen along every roadside and in every field in summer, are of medium size, and are white, yellow or orange, usually more or less marked with black. Some of these butterflies have long been known to people living in the country as "the Whites," and others as "the Yellows," according to the prevailing color. None is ever very large, like the swallow-tails, and none is very small, like the blues and the coppers.. Besides, they always have six legs of about equal size, and they use all of them when clinging to a support or walking. Learn to observe butterflies at rest, and notice which have six legs and which seem to have only four. The swallow-tails have six legs, but they are all large ; medium-sized white or yellow butterflies may safely be labeled with the family name, Pieridæ.

The "Coppers" and the "Blues" are known to all boys and girls. They are small butterflies, with slender bodies and bright-colored wings. There are nearly always white rings on the antennæ. They are not easily caught, and will often lead a spry boy on a lively chase. They are also rather difficult to mount properly, because their wings are very delicate. When finally ready for the box, they should be labeled Lycænidæ, which is the family name scientists have agreed to call them by.

The members of the largest family of butterflies use only four of their legs. The fore legs are so small that they are useless, and are folded on the breast, looking like a little tippet. These four-footed butterflies all belong to the great family Nymphalidæ.

One of the largest of this family is the Monarch, or Milk-weed Butterfly. It is slow and graceful in flight, and one of the most beautiful objects in our fields and pastures. The wings are light brown, with the veins and borders black, with two rows of white spots. The upper surface

of the wings is brighter than the under, and as the wings are always raised upright when the butterfly is at rest, it is then less conspicuous than when flying.

Another butterfly, smaller than the Monarch, but looking and flying almost exactly like it, is the Viceroy. It is said that birds do not eat the Monarch, because, as is supposed, of a bad taste or smell. The Viceroy is good to eat, but fools the birds by looking like the Monarch. This way of escape from natural enemies is called "mimicry," and is quite common among many sorts of animals and plants.

There are many beautiful butterflies in this great four-footed family, and among them are the Fritillaries, whose caterpillars feed on the leaves of violets. These butterflies are commonly a little above medium size, and all have a characteristic family look. The color of the wings is what is called fulvous, bordered and checkered with black.

The Red Admiral, the Painted Beauty, and others of the group called Angle-wings, are justly considered prizes by young collectors, and these, too, belong to the family Nymphalidæ.

It would require a good-sized book in which merely to mention all the kinds of butterflies that are found in our country, but there is one that must not be left out, even when we are naming only a few, and that is the Mourning Cloak. In Germany it has a name that means nearly the same—the Sombre Mantle, but in England it is called the Camberwell Beauty. It is a beautiful butterfly. Its wings are purplish-brown, with a broad yellow border, inside of which is a row of blue spots.

The Mourning Cloak appears early in the spring, and is quite abundant even late in the fall. This is because it is "two-brooded"—that is, there are two sets of eggs and two generations of Mourning Cloaks every year. A few appear to live through the winter, as they are often found flying about in wooded places very early in the spring.

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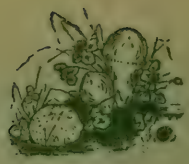

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"A FREAK OF NATURE."

NATURE STUDY.

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VOL. IV. April, 1904. No. 11.

"A Freak of Nature."

BY EDWARD J. BURNHAM.

Nearly forty years ago, a boy who lived in a country town not far from the city of Manchester, N. H., observed a strange growth at the very top of a pitch-pine tree. Every time he passed that way his curiosity increased, until one day he climbed the tree, cut off the queer object and carried it home. In course of time he went away to school, fitted himself for his life work and made another home for himself in the city, but he still treasured the object which had excited his boyish curiosity. He preserved it carefully for many years, and then placed it in the museum of the Manchester Institute of Arts and Sciences.

This queer object, for whlch the boy risked breaking his bones, is a huge cluster of cones. There are nearly a hundred of them, all perfect, arranged in eleven spiral rows winding around the stem on which they grew. This

was the main stem, the apex of the trunk, at the top of the tree.

This unusual cluster of pine cones is one of those objects in nature which people call "freaks," until they learn that nature never wastes time or energy in silly performances, but always has a good reason for everything that it does. It is so far from being a freak that it is instead a memorial of the desperate effort of a wounded tree to produce seeds quickly and abundantly that there might be other trees of its kind when it was dead and gone.

It is the special business of every plant or tree to grow seeds, and if it is injured it will make a greater effort, as if it were really conscious and felt that its time was short.

If a grapevine is pruned it will bear more grapes, and if a fruit tree is trimmed it will yield more fruit, at least for a time.

Something happened to the topmost bud on the stem of the tree that bore this great cluster of cones. Probably an insect stung it, laying an egg in it, and the grub that hatched from the egg ate the life out of it.

The tree was hopelessly ruined. It might send its taproot down deeper in the earth; its branches might continue to spread outward; its stem might thicken; but it would never reach higher toward the sky. Its hopes were blasted. If nothing had happened, if it could have gone on growing upward, it would have taken its time about the seeds. It was a young tree, and some years might have passed before it bore cones at all. Then it would have scattered them about, a few in a place, often one alone, sometimes three, rarely five, in clusters on its branches.

But the young pine had been wounded. It could grow no taller, and it behaved as if it knew that what it was to do must be done quickly. It hurried its sap to the injured part and put out a multitude of buds, many of which

came to be cones, packed closely together and placed orderly in spiral rows in obedience to the tree's law of being. Some of these cones are now open, but many are still shut, with the seeds in them.

The queer object which caught the eye and aroused the interest of the boy naturalist is not a freak. It is rather a chronicle, in which is told the story of a wounded tree which did its best to make sure that there should be other trees of its kind in the world when it should itself be forgotten.

Nature Study--The Bird's Nest.

BY O. M. MEYNCKE.

Bird life is wonderfully interesting to children and as a means of serving as an introduction to the fuller enjoyment and appreciation of our feathered friends during the spring and early summer season, when the overtures of these tribes are so liberally displayed, the enterprising and skillful teacher can find no more suitable material for the beginning of such work than the deserted nests. A bird's nest is, at first sight, a very simple and crude-looking object, but it is an object entirely worthy of investigation. It will be discovered that close inspection and study are required before its many interesting points of workmanship and the purpose each serves, are revealed to the student.

It is the purpose of the writer to call the attention of teachers to this one kind of material so cheap and available, at least to most of the rural district schools, and to further present some suggestions and a simple outline to serve as a plan in the study of birds' nests. It is important to note that this work of examining the old nests now is doubly enhanced, in one sense of the term, and will mean much more to the investigator since it is intended to

be conducted at that season of the year when the avian architects themselves are beginning their maneuvers pertaining to the selecting of sites and constructing of nests. It will create a stronger interest on the part of the pupils in school, when they have examined the nest in hand, if, at the same time, they have opportunities to observe the birds closely while in the act of gathering material and putting it together to form the nest. This kind of a sequence in the work will afford opportunities for them to verify and strongly impress certain ideas and conclusions derived from examining the deserted nests.

The ideal act of beginning the work is for teacher and pupils to go out reconnoitering and search enthusiastically for the deserted nests, bring them into the school and note the kind of sites and the character of the environments. One gets a fuller meaning of an object when its complete setting—environment in this case—is comprehended. An eventful and well-planned search for nests and the pleasure of experiencing the discoveries connected with it, will contribute wonderfully in creating an enthusiastic spirit in both teacher and pupil. Usually the child needs no introduction to the realm of nature. He has been taught to realize that wealth and enjoyment of life in former experiences. It is too frequently a fact that it is the teacher who is the laggard and obstruction to a fuller enjoyment and participation of this part of the work, and who is too much disposed to regard nature study as something accessory, if not a Cinderella, to the school curriculum.

One caution must be strictly observed, for it is of very great importance, and that is to impress on the mind of the child that these nests are deserted ones and are of no further use to the birds, but children must not visit any nest while the birds are brooding. A typical collection of nests taken after the birds have forsaken them is no sin. Such a collection is desirable for the school, but no collec-

tion of eggs should be permitted. Collections of eggs are needed by professional ornithologists and public museums, but boys and girls in school do not need them. Procure the nest in every case, if possible, with a part of the branch or twigs supporting it. The following outline, together with interposed questions and explanations, is submitted as a plan of presenting the work to a class in the study of any bird's nest:

1. SELECTION OF SITE.—This is commonly a tree, shrub, vine, stump, log, ground, fence, wall or building. Have the pupils to enumerate a list of places in which they have seen birds build their nests. The conditions which are to be regarded in determining the different sites are now in order and may be conveniently grouped under the following four heads:

1. Convenience of building material.
2. Enemies.
3. Food.
4. Safety.

For the first lesson select nests of some familiar and well-known bird, as the English sparrow or robin, and have a number of them before the pupils, and also select one or more of another species, as that of the Baltimore oriole, for comparison.

Do the nests vary? In form, in the material selected and in the places selected for their building? Was the nest under examination fastened to a swaying or to a firm branch? How does it differ in the two situations? Why? Is the nest easily seen by enemies? What care is taken by the bird to insure safety from accidents, storms of wind, rain, heat, etc? What other means of protection can you observe? Do the branches and leaves form a canopy or "pagoda" over the nest?

2. CONSTRUCTION.—How does the bird shape the nest? Is it shaped by the bird occupying a position on the inside

of the nest or is it done entirely from the outside? Birds employ both attitudes. Consider the material of which the nest is made, and note the order and manner of arranging the material. Make out a list of the material, as sticks, grass, leaves, hair, feathers, soil, wool, down, stems, etc. Consider the sources and localities from which the bird has obtained it, for the purpose of showing how the environment is represented and appropriated in the kind of material selected. Consider carefully its appropriateness as nest-building material. Why use this kind of material? How is the fibrous material placed in the structure of the nest? Are the alternate strips in opposite directions? Is the nest simply lodged between the branches, or is the material, in part, bound around them to secure it? Is it built in the crotch of an upright branch, or is it supported by suspension from twigs attached to the sides of the nest? The following different manners of attaching nests have been observed: 1, Supported in crotches of erect branches; 2, Supported by suspension from twigs attached to side of nest; 3, Supported in a fork of a horizontal limb; 4, Attached by the rim in the manner of a hammock. Mention other ways of attaching nests. Has the bird used any material of a kind designed to cement the parts together, or to solidify the nest? Give examples.

3. Comparison.—The wise teacher will not attempt to work with objects of this class without providing abundance of material for comparison. This is to consist of a variety of nests, and their data systematically and conveniently displayed before the eyes of the pupils, and the recalling of a number of well-known examples of birds and their nesting habits. A lesson on an isolated specimen without any reference whatever to similar objects, or without an equivalent in the form of pictures, stories, poems and practical experiences relating to the objects under consideration, is far from constituting the best kind of instruc-

tion. It is advisable to place much emphasis on this part of the lesson.

Apparently there has been a gradual development of the nest-building art among birds, some of which are very simple designers, as in the case of the pigeon or dove, while others are very elaborate, naming the crows as examples. It is supposed, on the part of the writer, that by stating a few of the fundamental principles upon which the science of bird-craft is based, citing a number of examples for sake of illustration and interruptingly introducing some questions, the average teacher may be induced to acquire more knowledge, and collect material with the view of ascertaining to what extent that development may be traced. In comparison, the work may be more thoroughly amplified by using various questions and by introducing examples of the life-habits of our well-known birds. Endeavor to procure two kinds of nests that will furnish a contrast of structure, as that of the English sparrow or robin and that of the Baltimore oriole. The sparrow puts together a large amount of miscellaneous material gathered from its familar haunts. The oriole builds a perfect pocket, woven out of fibers, thread, cotton and similar material, suspended near the end of a long, swaying branch from twenty to thirty feet from the ground. Its nest is one of the wonders of bird architecture, and every child should be given an opportunity to examine it carefully. What other birds build woven nests? What kind of a nest does the sparrow build? What is a platform nest? What is a pensile nest? A semi-pensile nest? Give examples. Do closely related birds build similar nests? Do any birds use grass while green? What protective use in this green grass can you discover? Does the inside lining vary? Find out about the orchard oriole, a first cousin to the Baltimore oriole. Audubon says that the former does not select any other tree than an apple-tree or weeping-willow

for a building site. He further says they use the finest, longest and toughest grass they can find, that the nest is hemispherical, and is supported by the margin only and is finished on all sides, as well as within, with long, slender grass. Some of these go around the nest as if coarsely woven together. Now this is the manner in which the orchard oriole (*Icterus spurius*) constructs its nest in Louisiana, but how does it construct its nest in Indiana? Can you confirm Audubon's account? Is it "supported by the margin only?" Examine in details the nest of either one of these orioles and trace the fibers or stalks of grass, measure them, and find how many times it is wound around the nest and whether it is "knit, or sewed through and through in a thousand directions, as if actually done with a needle." "In the Middle Districts it is usually lined with warm material," says Audubon, and "inside of [orchard oriole's] nest is composed of wool or light, downy appendages of the seeds of the button-wood." Examine how the outward work is extended to the adjoining twigs around which it is twisted to give more stability to the whole and prevent it from being overset by the wind. Note that this great ornithologist says that in the colder latitudes these birds build their nests with warmer and softer inside lining. This is important in point of utility and environment. Again, when they choose long, pendant branches of trees instead of more rigid ones, is the nest any deeper? Why does the Baltimore oriole prefer the elm to the oak in selecting a site? Two reasons; 1, On the oak the squirrel in quest of nuts would destroy the contents of the nest; 2, The branches of elm are more pliant than those of the oak, a quality very important for the safety of the nest.

Is there any support to the assertion that the nest-building habits of birds have gradually changed in many particulars? In their primitive habits the orioles and other

birds employed long, slender grass and the fibrous bark of vines and tender plants indigenous to this country, but since the advent of the wild hemp and the Indian mallon they resort almost entirely to these plants for their building material. Perhaps the nest of no other bird exhibits so much evidence of constructive adaptability as these American orioles. Wilson, the ornithologist, says they "exhibit not only art in the construction, but judgment in adapting their fabrications so judiciously to their particular situations." It does not all proceed from mere instinct; if it did, they would build their nest in the same manner wherever they might fix it, and without any relation to their immediate surroundings, but we are able to cite a number of examples as strong evidence that such is not the case. As an example, in southern Indiana the common yellow-billed cuckoo builds a very fragile nest consisting, for the most part, of the withering staminate catkins of the oak blossoms, while in northern Indiana, in the presence of numerous swamps or transient pools, where greater dangers would be incurred, it disclaims the impulse of instinct and constructs a substantial nest. It seems to reason from cause to consequence and acts with a guarded eye for future safety and present necessity. Let this fundamental fact of bird-life be developed before the pupils by citing examples and presenting a series of questions that birds do change their habits and are not guided solely by instinct.

What can be said of the chimney swifts and other birds in this respect? How did the orchard oriole, barn swallow and house wren get their names? Orioles prefer plant fibers, but the following material has been found in the structure of their nests: fish-line, kite-strings, bits of rags, calico-ravellings. Do you notice any difference in the beauty of the nests? Do they appear to build for beauty, or for disguise and concealment? Should the nest not al-

ways be regarded an utilitarian structure? Can it be called a "procreant cradle?" It is the receptacle which the parent birds have provided for the eggs during the period of incubation, and afterwards for the young until they are able to fly, and it matters not how beautiful and elaborate it may be or how much labor it cost in its construction, it is forthwith deserted. Do all birds build nests? What kind of a nest does a goose or a duck build? Does a chimney swift light on the ground? How do they gather the twigs? For fine architecture the feet must grasp. No web-footed bird builds a really clever nest. The beak, legs, feet, and in some cases the breast, are the tools with which birds build nests, and the peculiarity and perfection of these parts would necessarily determine the comparative beauty and perfection of the nest. Such, however, is not the case, for many birds with finely-pointed bills and long, agile legs construct clumsy nests, while other species much less favored in the merits of their tools build nests that are paragons of beauty and perfection. As examples, some of the swifts with their weak bills and abnormally short legs are unable to make an elaborate nest, while other members of this class make remarkably elaborate nests.

Against these birds we have the hummingbirds, with their nearly functionless legs, that build most elaborate little cradles, scarcely surpassed anywhere in the wide range of varied bird architecture. On the other hand, some species of swallows put up mud-fabrics that are genuine works of art. The magpie builds a formidable fortress. The tailor-bird, weaver and oven-bird are remarkable instances of the bird-nest craft. The grosbeak's nest is a perfect circle composed of a variety of carefully selected material, and artistically arranged on small trees and usually not more than five to ten feet from the ground. The chimney swift constructs its nest in an anomalous way. It is attractive both in point of beauty and workmanship.

What principle of utility does this bird show in forsaking the pure air of the forest for a sooty, dark chimney? Is it a protection against squirrels, owls and mice? Notice how their nest is constructed. The twigs are glued together by saliva, and are placed across each other forming a sort of basket work. Every piece is cut off to suit its position in the nest. Here we meet with a very unique piece of bird architecture for which the ingenious builders have selected a site equally anomalous. In the selection of such a site is it not evident that the primary, we may even say the exclusive, motive is that of concealment? To what extent is nest decoration a superfluity prompted by a taste for the beautiful? Is not such so-called nest decoration a part of rigid utility and a special effort to evade discovery by harmonizing the exterior of the nest with surrounding objects?

Finally let it be noted that certain groups of birds exhibit a high degree of flexibility in the facilities they have for adjusting themselves to an abnormal environment, when in their nesting they select discarded cans, crockery, flower-pots, baskets and old hats. On the other hand there are large groups of birds that adhere closely to their native instincts, and are remarkable for the uniformity of their nests.

National Museum, Washington, D. C.

At Cambridge, England, there has recently been exhibited some living specimens of an exceedingly curious insect from Rangoon, brought home by Capt. C. E. Williams. It is related to the mantis and resembles in form and color an azure-blue flower with a black spot in the center that looks like the tube of a corolla. The abdomen is drawn back and is the stem of the blossom. Butterflies and other flower-loving insects alight upon the beautiful bait and are immediately seized and killed.

The Story of Pike.

BY UNCLE NED.

CHAPTER II.

Pike, in catching a tiny beetle and making his first meal from it, had done a very unusual thing for so small a pickerel. It happened once, but it was not likely to happen again. He grew tired and hungry waiting for more small beetles, and began looking about for something to eat.

Across the brook from the sandbar where Pike was hatched, there was a large patch of still water, with a muddy bottom, and covered with lily-pads. In this water were a great number of "wrigglers." These wrigglers were young mosquitoes which had hatched from eggs laid in the water a short time before, and which had not yet learned to fly, or even got their wings. They had a queer habit of rising to the surface and hanging head downward.

Pike found that he could easily catch wrigglers when they came up to breathe and were resting in that way. It was great sport for him, and sometimes he had as many as twenty at once stuffed into his little stomach. For several days he fed entirely upon them and grew very fast. Of course it made fewer mosquitoes, but nobody ever missed them.

Pike had two good reasons for staying near the surface of the water. He found things there that he liked to eat, and there were dreadful creatures below that wanted to eat him. So he early formed the habit of lying still for hours at a time with just enough water over him to keep him wet, and the habit was so strong that he lived that way all his life, even after he was so big that he did not need to be afraid of anything that lived in the water.

But when he was small there was reason enough why he should be afraid of the many hungry things that swam around him, crawled over the sand, hid among the rocks or burrowed in the mud. Besides the fishes, that would have been glad to eat him before he got to be big enough to eat them, there were flat things and round things, long things and short things, all alive and very hungry. Nearly all had gills to breathe with; some carried their gills inside and pumped a stream of water in and out, much as creatures on the land breathe air; others wore their gills outside, waving them like fans. Some were covered with hard shells, some with bristles and spines; some built houses of bits of wood and dragged these houses around with them. But, whatever fashion each might have for himself, all had big jaws or sharp beaks and knew how to use them.

Of all the strange and hungry things at the bottom of the brook where Pike was hatched or of the lake where he lived afterwards, the ugliest in appearance and the most to be feared by little fishes, were the dragon-fly nymphs. Dragon-flies are graceful and beautiful creatures as we see them flying about in the air, skimming over the water of a lake or the grass of a meadow, but when they are young and live in the mud, they have neither beauty nor grace. Their legs are awkward, their eyes big, their jaws fierce; and they have an under lip that is the queerest and most cruel thing imaginable. It is long and narrow, more like an arm than a lip, and it has a joint or hinge near the middle, like an elbow. At the outer end is a pair of strong, sharp jaws.

The dragon-fly nymph does not wander around, hunting for food, but just waits. It hides in the mud up to its eyes, and stretches out its long, jointed under lip. By and by, some insect or small fish comes along, does not notice the trap, and is caught.

One day, when Pike was still living among the lily-pads and catching wrigglers, a shoal of very small minnows came that way. None was more than an inch long. Just as Pike was wishing he was a little bigger, so that he might have his first fish dinner, something happened that startled him. He was almost always being startled, anyway. It must be trying to one's nerves to live in the water.

The minnows had all been headed up stream; but instead of going on, they moved their tails just enough to hold themselves against the current, as shoals of minnows often do. One was resting right over the trap of a dragon-fly nymph, when the trap shut up. The little fellow struggled hard, but the strong jaws would not let go, and it was soon all over with him. The other minnows swam away in a hurry. Pike edged over to the other side of the brook and lay perfectly still at the surface of the water, over the clean sand and in the bright sun.

Pike had reason to be afraid of mudholes, and to dread the deep water of the brook, but he would have made his voyage quite as safely if he had dashed boldly across. For he and the dragon-fly nymph had one thing in common besides their big appetite. The nymph could thrust out or bring in its lower lip so quickly that no one, if looking ever so sharply, could see the movement; Pike could dart so swiftly that, while he was little, he could not be seen.

This was because it takes a little time, perhaps half a second, for the eye to be fixed upon an object so that it can see, or change and then be fixed so as to see again. Pike, before he grew to be too big, might be seen in one place and a minute after be found in another, without having been seen to move at all.

It was a pleasant afternoon; Pike was lying in the sun near some scattering blades of sedge-grass that had come up through the sand; a boy and girl came to the brook to

play. They were small and barefooted; they waded about in the shallow water. Sometimes they stood still, holding hands, and digging their toes in the warm sand. Suddenly the girl exclaimed:

"Oh! what a little pickerel!"

Pike was not more than three steps away, by the tall grass.

"You just keep right still, and see me catch him!" said the boy.

He moved carefully toward Pike, bending slowly over and lowering his hand. He made a quick plunge, and both thought the pickerel was surely caught, for they had not seen it move at all; but the chubby hand was empty. The girl laughed, and the boy looked crestfallen.

Presently, after looking steadily in the water, they saw Pike scarcely three feet away. The boy was a plucky little fellow, and made another attempt. But Pike disappeared as before, leaving them to wonder why they did not see him go.

The girl began to laugh again, but suddenly stopped to cry out:

"Look! there he is!"

Pike never went very far, and the boy tried over and over, but the pickerel was not to be caught that day, or for many a long day after.

Now that nearly all of the highest mountains in America and Europe have been scaled, mountain climbers are turning their attention to the higher peaks of the Himalayas. The record is now held by Dr. William H. Workman, who last summer ascended to the summit of a peak of Chogo Lungma in the western Himalayas, a height of 23,394 feet above sea level. Mrs. Workman reached a height of 22,567 feet, the highest point ever reached by a woman.

A Song of Dawn.

BY CHARLES H. OAKES.

March 13, 1904—Note 7.

While the darkness of night was falling back before the dim glimmering of the dawn, I lay in bed thinking.

The room was in Cimmerian blackness save for a penciled streak of dull gray between the curtain and frame. The stillness about me was as deep as that of a cavern. Suddenly, like a rifle's report, there entered my ears the song, "Whoit-cheer, whoit-whoit-whoit-whoit-whoit, whoit-cheer!" It could have been heard a quarter of a mile. "Cheer" was long drawn out, and accented, followed by a rapid run of "whoits," with the last "whoit-cheer" like the first.

The loud, sweet, wild notes were as clean-cut as those of an oboe, and were poured out just ten feet from my head, through a thin door. I never heard so thrilling a sound in nature. Often enough I had heard him sing before, but never at a time of such absolute quiet. It was that that gave the strain its strange alto relievo setting.

At about the same time of the following morning, and under similar conditions, I lay waiting for him with closed eyes, and in a tension of expection. It came cutting straight through the silence without a trace of preliminary warning: "Whoit-cheer, whoit-whoit-whoit-whoit-whoit-whoit-whoit!" This time he had omitted the final "cheer," and substituted a "whoit" in its stead.

I arose, musingly smiling from the effect of the wonderful whistling. Looking from the window, in a little while, I saw him tweaking a kernel from an ear of corn which was tied to a limb. Thus he carelessly broke his night's fast even as he had a few minutes since, that of the world's night-silence. And the multitude dare deem birds beneath

their superior notice, fit for cranks alone—birds that have inspired the poets to as noble an expression of sentiments as even the most beautiful women have evoked from them; see Shelley and Wordsworth, Lanier, Keats, and more obscure ones.

The next morning his fine song was flattened between the rival crowings of a pair of cockerels.

It was Rufus, my wild cardinal grosbeak, that roosts in a dense honeysuckle-vine clinging around the porchpost by the door. He has a history, he and his dainty lady, that I have been three years reading, and am not yet through it. She is not much about this past week, and has quit roosting in the vine of nights. She is, doubtless, building down by the run. I'll see about it.

March 17.

The wind carries a chill this evening. Rufus is roosting in his wife's last year's nest in the vine. Peeping around the door frame, I see only the darkened shape of his head and tail against the eastern twilight sky, his body is sunk from sight in the cavity. Good night, Rufus.

Baden, Penn.

Nature Study Lessons. XXIII.

BY EDWARD J. BURNHAM.

The flies, constituting the order Diptera, are very abundant as to individuals and numerous as to kinds. They are to be found throughout the summer in houses, in the fields, hovering about flowers, resting on leaves of shrubs and trees and on blades of grass—almost everywhere except in the water, and the young of many species are found even there.

They are easily captured, but unfortunately it is not so easy to separate them into the families to which they belong. The books that have been written about them are

intended for trained entomologists, and the boys and girls must be content for the most part with pinning their flies in their boxes without classifying them.

Nevertheless, something can be done, even with flies and by children.

One may feel sure about the house-fly. Notice the shape of its body, the size and shape of its head, and the relative length of its legs. This familiar fly belongs to the family Muscidæ, and if other flies that resemble it are placed in the same family there will not be so many mistakes as one might expect.

About the bee-flies there will be no mistake at all. They are to be found in and beside roadways, especially in springtime. They have a way of hovering for some time in one place and then moving to another a few feet away, where they will pause in the air again. They are more difficult to catch than most flies, and will often give the collector a lively chase. The bee-fly, when on the wing, looks a little like a small bumble-bee, and when captured it will be found to have a small head and a very long and slender proboscis or tongue. They are to be labeled Bombylidæ.

The robber-flies are quite abundant in the fields, and are mostly of large size. They have long, slender abdomens and strong wings, but the most marked characteristic is the long, pointed proboscis, with which the robber-fly sucks the life out of its victims. It not only catches other flies, but is able to destroy large insects, as bumble-bees, tiger-beetles, butterflies and dragon-flies.

It is a gruesome but not uncommon sight to see a butterfly, as one of the yellows or a copper or a fritillary, sailing along in a straight line without moving a wing. The contrast between this enforced flight and its usual, graceful, zigzag movement is very striking. It has been seized by a robber-fly, which is greedily sucking out its juices

while on the wing. The robber-flies may be distinguished by their size, by their long, pointed proboscis, and by the fact that the space between the eyes is "excavated," or hollowed out. They should be pinned by themselves and labeled Asilidæ.

Most boys and girls know the crane-flies, with their six long, straggling legs that come off so easily as to make it difficult to secure and preserve a perfect specimen. The crane-flies have slender bodies and long, narrow wings. They are common in the fields, and there are many species, of different sizes and colors, but they all have a family likeness and are easily recognized. They comprise the family Tipulidæ.

There are many flies commonly found about flowers and shrubs that bear a close resemblance to some other insect which can sting. Some look almost exactly like the honey-bee, others like bumble-bees, and others again like wasps. Some are striped with yellow or white and look like the wasps that are commonly called hornets. Some fly with a humming sound that makes the mimicry all the more complete.

Of course they are entirely harmless and may safely be handled like other flies, if only one can be sure that they are only make-believe bees and wasps and not the real thing. But it is quite easy to be mistaken, so long as the insects are on the wing, and it is a severe test of one's keenness of observation to decide whether to venture to catch one in the hand. There was once a bright boy who thought it great sport to "dare" his father to make the trial. Even a fairly good entomologist may sometimes be deceived.

Most of the flies which mimic other insects for their own protection belong to the great family Syrphidæ, of which there are known to be nearly two thousand species in the

world, and not fewer than three hundred species in North America alone.

The mosquitoes, the midges, the gnats, the dance-flies, the black-flies, the horse-flies and the flesh-flies all belong to the order Diptera and are separated into many families, but it is not easy to distinguish them until one has become well advanced in the study of entomology, and boys and girls will not commonly make large collections of them, or of the two-winged insects generally.

Plant Mimicry.

The quaintest of all fungus pretenders are those which mimic birds' nests and are known as the bird's nest fungi. There are at least three different sorts of fungus which pretend to be nests. The resemblance is the more extraordinary in that the little round fruits of the fungus lying inside the cup-like nests look exactly like eggs. Perhaps the strangest part of it all is that botanists have never yet succeeded in discovering the reason of this mimicry on the part of the bird's nest fungi.

The plant worm of New Zealand is another fungus oddity which for a long time puzzled men of science. It grows from the body of the grub of the bulrush caterpillar and at first sight appears to be a small bulrush. Stalk and head show a perfect resemblance to the plant. But the seeming bulrush is a fungus pure and simple, of which the spore has settled in the body of the unfortunate caterpillas. As it grows it absorbs the body of its host, but it takes nothing from the ground, as it would if it were indeed a real plant.

A great many people imagine that the oak apple is a fruit of the oak tree, for when it is fresh it bears a strong resemblance to a small rosy-tinted apple.

But here again the tree deceives us. The oak apple is a gall or disease caused by certain insects which pierce the bark and instill a sort of poison, causing a gall to form, which protects and makes food for their young.—*London Answers.*

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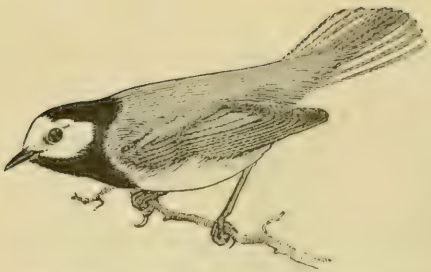

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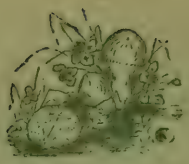

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CYPRIPEDIUM. THE "MOCCASIN FLOWER."

STATE FLOWER OF MINNESOTA. FROM DRAWING BY JOSEPH N. PROKES

NATURE STUDY.

PUBLISHED UNDER THE AUSPICES OF THE

Manchester Institute of Arts and Sciences.

VOL. IV. May, 1904. No. 12.

Our Legal "State Flower."

BY JOSEPH N. PROKES.

Minnesota, the Northstar state, derives its name from the river as called by the Indian tribe of Dakotas, "Minisota," meaning in their language, water sky-colored, applied to the stream in its natural state in the summer seasons, after the waters were cleared from the roiling caused by the spring floods.

Within the basin of this magnificent Minnesota river, one thousand one hundred and seventy-four species and varieties of flowering plants are known, and have been collected for the herbarium of the Minnesota State University, and constitute a valuable collection for the increase and diffusion of knowledge.

Of the one thousand five hundred eighty-two species as found within the boundary of the state, a plant of the Orchis family, called *Cypripedium*, was chosen for the State Flower. Six species which bloom from May to July are found in Minnesota, namely: the *C. candidum*, Muhl.,

the small White Moccasin Flower; *C. parviflorum*, Salisb., the small Yellow Moccasin Flower; *C. pubescens*, Willd., with much larger yellow flowers; *C. arietinum*, R. Br., the Ram'shead Moccasin Flower, with red and whitish veiny lip; *C. acaule*, Ait., the stemless Moccasin Flower, with leaves on the ground and a large rose-purple flower on an erect scape, sometimes nearly a foot high; and *C. spectabile*, Sw. Last summer, on a recreation vacation spent in the Jack pine forest in Wadena county, Minnesota, while crossing a tamarack swamp, a nook where myriads of the latter moccasin flower, with most showy large flowers of mingled white and pink-purple color, was encountered.

I was filled with joy and admiration. Grown here in the heart of the forest, a handful of these forwarded to my pet niece back home, indeed would prove interesting, however that venture I did not take, lest I violate the laws of that noble Wild Flower Preservation Society of America.

Jackson, Minn.

Bird-Feeding Time.

BY EDWARD J. BURNHAM.

Although the snow lay deep and the weather continued steadily cold for a long time last winter, the great abundance of sumach seeds, of birch seeds, mullein seeds and poison-ivy berries and the like that remained when spring came, indicated that the winter birds had not suffered from lack of food—at least not so much as in many milder winters, when there are periods of sleet, sometimes prolonged for days.

The impression that the birds were not suffering so severely as in many previous winters changed to conviction after repeated examination of nature's feeding-troughs—

those hollows caused by the melting of the snow around trees, fence posts and boulders, and alongside stone walls, into which the wind carries great quantities of leaves, blown from the oaks and bearing in minute galls and excrescences myriads of insect larvæ and pupæ, not to be sure, but offering an acceptable variation to the diet of the birds. Into these troughs, also, the wind blew a wealth of seeds from the gray and yellow birches, which last season were borne in such profusion by nearly every tree.

It is true, also, that birds suffer less from cold than is commonly supposed. Indeed, it is quite probable that a well-fed winter bird, if sheltered from the wind, does not feel the cold at all. But when, as often happens, a rain or storm of sleet is followed by days of cold, during which an icy coat is frozen to every twig and covers every seed; or when, as this year, snow in large quantities falls in April, after many summer birds have returned, there is inevitable and widespread suffering among the feathered tribes. It is in the times of sleet in winter and of late snows in spring that the birds need assistance.

The following, from a personal letter, not intended, at the time it was written, for publication, gives an interesting account of the way the birds were cared for at one New Hampshire home during the unusual April stress:

"I wonder if I told you what a lot of birds we fed during those unseasonable snow storms—*thirteen* kinds. All our winter birds—hairy woodpecker, downy woodpecker, nuthatch, chickadee, tree sparrow, bluejay (bad 'cess to him for a rascal!) junco, then the spring birds, robins five or six, a flock of twenty fox sparrows, four bluebirds, five or six purple finches, a chipping sparrow, and, think of it—*four hermit thrushes!*

"I worked valiantly to provide food, but I am afraid one or two bluebirds succumbed to cold and starvation. The snow was eight inches deep and it was no easy matter to shovel it away from enough ground to make a feeding place.

Mr. W. had a great pile of dead leaves, with a little stable man-

ure, and I cleared all that; then I turned over a lot of boxes and boards, finding plenty of insects under them, and dug down for fish worms. I got about thirty.

"It is interesting to watch the different ways of the birds in such stress. The robins set to work with vigor, finding every inch of bare ground, overturning dirt, leaves, and even quite large sticks in their quest for worms and grubs. The bluebirds stood as they always do, on a tree or fence, and looked down. If they could not see anything from their perch, they were helpless. Purple finches, of course, were all right. They ate on the piazza as always; but I was amazed to see a few of them following the example of the winter birds and eating suet. They snipped daintily at it. The fox sparrows enjoyed themselves. They swarmed over the leaves and manure I uncovered, finding all kinds of seed and insect food, kicking the leaves in all directions. They do not scratch, but kick—"get there with both feet," and they made the air ring with their lovely songs.

"The hermits did not seem to know what to make of the snow. They neither kicked nor picked, and fared hard. One of them came in on the piazza and ate some bitter sweet berries that had been out there for decoration (in hemlock branches) for two winters, and which must have been poor eating, but he wasn't disposed to be finical. Another flew down to a spot I had specially prepared for him with fish worms and other grubs and worms and the imps [English sparrows] spied him before he had eaten two mouthfuls and were upon him, one of them literally landing on his back. Poor, shy little Poet! He flew as if the devil were after him and the imps wouldn't eat one of the worms after all. They *did* literally "clear the board" when I spread it with several kinds of seeds and bread and cake crumbs. None of the native birds had even a chance to try it."

It will be observed that the correspondent, otherwise one of the most kind-hearted persons in the world, has a great dislike for English sparrows, and not wholly without reason. For myself, I must confess to a feeling of sympathy with them. They did not come to America of their own choice, and now they are here, they must look out for themselves or perish miserably, as, indeed, many of them do.

The English sparrows make many a snow-covered shrub

in a city lot more cheerful for me of a winter morning. I was interested and somewhat surprised, however, to see, in a recent number of *Nature Notes*, the excellent organ of the Selborne Society, that this aggressive bird is held in the same detestation by many people in England as it is almost universally regarded here.

Thrilling Migrations of Birds.

A shipwrecked man who is picked up at sea, after enduring days of privation in an open boat, has generally an exciting story to relate. If birds could talk, some of those in the New York zoological park could tell of experiences which would dwarf any tale a mariner could spin.

When the birds migrate north in spring and toward the tropics in the autumn, they sometimes pass over large bodies of water, and a favorite route is along the seacoast of the countries over which they fly. These routes are so fixed by the law of precedence that even where islands have disappeared in the process of geological changes, birds will still concentrate their flocks and cross considerable bodies of water at the exact places where formerly the passage was made less difficult and the way more clearly marked by the long since submerged land. On these nocturnal journeys—for most birds fly at night, from fear of hawks—storms at times come up suddenly from the landward side and drive the birds helplessly out to sea. All they can do is to keep their balance, which the very velocity makes an easy matter, and drift along, fortunate if they can manage to avoid the black waves and the stinging spray beneath them.

A European heron recently flew on board the steamship Glencartney when the vessel was about two hundred and five miles southwest of Cape Cormorin, the southern extremity of India. The bird did not appear exhausted, al-

though it could not have rested since it left the land. There is no migration route near this place, so it must have been forced seaward while feeding or flying along the shore. The bird was caught, and, after one wing was clipped, made itself perfectly at home on board ship. It fell overboard twice, but kept afloat until rescued by a boat's crew. The heron was confined for a time in the potato bin, and defended this base of supplies so vigorously that the daily ration for the crew was obtained only with difficulty. Fish scraps kept the bird in fine condition until it reached New York, and finally its home in the zoological park.

The bird which thus far holds the record for a sensational capture among the birds in the collection is a little English turtle dove, which flew exhausted on board the Hamburg-American liner Phœnicia when that ship was not less than seven hundred and fifty miles from the nearest land, the coast of Ireland. It was so famished and bruised by the wind and rain that it showed no fear, but allowed itself to be caught and carried to the dining-room, where it ate to its heart's content. What a terrible experience it must have passed through, heading mile after mile for midocean, powerless to turn and beat back against the irresistible force of the tempest! How it must have strained for a glimpse of some resting place, some hint of a haven, and how welcome must have been the sight of the ship, whose path it so fortunately crossed!

Hundreds of birds must perish in this way, judging from the number which occasionally find temporary resting places on the yardarms of ships. The storms which carry them from shore die away and leave them bewildered in a waste of waters with no food, drink or perching place within sight, and ravenous fishes waiting for the moment when at last the tired wings refuse to do their work.

Seven hundred and fifty miles with nothing but its

wings to support it, ought indeed to make a bird trust itself to the hands of any one, but none could be so base as to refuse such a supplicant the rest and food it craves. As we look at this dove, contentedly preening its feathers in its cage, the imagination easily pictures it, a speck amid the raging wind and waters of the mid-Atlantic.—*New York Tribune.*

Conception of Birth-stones and Flowers.

BY JOSEPH N. PROKES.

January—Garnet: constancy. Snowdrop: friendship in trouble.

February—Amethyst: contentment. Primrose: believe me.

March—Bloodstone: courage. Violets: love, faithfulness.

April—Diamond: innocence. Daisy: innocence.

May—Emerald: success in love. Hawthorn: hope.

June—Pearl: purity. Honeysuckle: generous and devoted love.

July—Ruby: nobility. Water-lily: purity of heart.

August—Moonstone: felicity. Poppy: consolation.

September—Sapphire: brings success. Morning-glory: affection.

October—Opal: hope. Hops: injustice.

November—Topaz: fidelity in friendship. Chrysanthemum: loveliness and cheerfulness.

December—Turquoise: prosperity. Holly: domestic happiness.

No artificial substitute for cork has yet been invented that will entirely take the place of the real article, but a natural substitute has been found in the wood of a tree that grows in Africa near Lake Tchad, which has a specific gravity less than cork itself, according to a German consul.

The Mediæval Naturalist.

BY STEPHEN D. PARRISH.

It is well for the NATURE STUDY students to go back in imagination a few centuries and see what the boys and girls, even "crowned heads and the courts," were taught by the Mediaeval Naturalist. For the purpose of this paper I will take the work of Phillipe de Thaun, first briefly giving a sketch of how he happened to write a book on natural history, and somewhat of the times.

Henry I. succeeded his brother William II. to the English throne in 1100. Henry was the father of Prince William, who was drowned at sea in the attempt to rescue his sister from a sinking ship, which had been wrecked by reason of the carelessness of a drunken crew under the command of the noted Thomas Fitz Stephens.

Tradition has it that after the king learned of the unfortunate death of his son and daughter, "He never smiled again." That is the first line in a verse of one of our most popular poems commemorating this sad event—away back there in the Middle Ages.

Because of his great progress in learning and literature, Henry was surnamed *The Beauclerc*, or The Scholar. About the time of his second marriage, to Adelaide of France, King Henry gratified his love for the study of nature, animals in particular, by establishing an "extensive" menagerie at Woodstock.

In the king's study his queen Adelaide took an active part and a deep interest. The celebrated French trouver, Philipe de Thaun, "skilled and learned," was directed to reduce to writing the "wisdom of the age concerning the strange beasts of the field and forest, the fowls of the air, the monsters of the deep, and such other

matters as might be of interest and instruction to Royal Students."

Not dwelling further on the history of these times and the cause of the production of this old book, termed in Latin *Bestiary*—as all books on zoology were called in the Middle Ages—I will do as did this quaint author, "plunge into his subject without further delay," and, as he also did, first bring into view the lion, using his, to us, queer symbolism and drawing from his text.

The lion, which he describes as the "king of beasts," has a frightful face, a great hairy neck, the breast square, hardy, bold, slender flanks, a large tail, flat legs, large cloven feet, long claws and is "combatant." It has an omnivorous appetite, devouring animals without discrimination, especially when hungry or angry. The author, however, excepts the ass of all animals who has spirit and courage enough to object violently to this propensity of King Leo; with true asinine perversity it "resists and brays, kicking up its heels in dissatisfaction" and braying out its protest. This sounds very much like the original of one of Æsop's fables, with which the author was apparently familiar.

Bear in mind that most of the then current "knowledge" of Natural History was based on fable and sailors' yarns, as some of it is yet. One, if not the main object of nature study, is to remove such errors as may yet linger, by inciting a deepened and loving interest in the study of nature, animate and inanimate, and in the higher planes, the spiritual and loving as well as the material.

Anent the lion, our author further tells us that when hungry, this kingly beast trotted to a convenient place, traced out an enclosure by trailing his tail on the ground, leaving an opening between the point of beginning and ending. From a neighboring looking place he cautiously watched this *gap* in the "tayle trace" or mark, it being

a peculiarity of this mark, so he tells us, that no beast will or can cross it. The unsuspecting victim, curiosity excited, the fleet-footed antelope, for example, browses around the outside of the line until it comes to the opening, and having walked inside the enclosure his lionship rushes out, closes the entrance or gap with a few "swipes of its tail," thereby securing its prey, which is disposed of at pleasure, if that be before the efficacy of the charmed "trace" has worn away.

In some sections of this country, a story is told in good faith that the cowboys or Indians in the southwest, when they want to capture a fine specimen of rattlesnake, circle a *hair* rope or lasso on the ground around his snakeship, gradually decreasing the enclosure until they are able to "box the snake" without damage. The theory is that no reptile will crawl over a cord or rope composed of plaited hair.

This and other similar "historical sayings" have grown out of this encorral story, given as a statement of fact by this twelfth century author—noted for "learning and wisdom." Snakes are caught, "boxed" it is true, but not in the way indicated. Ask some honest rattlesnake hunter of Pennsylvania, or, better still, read "The Snake Hunters of the Green Mountains."

But let us proceed with our author, who informs us that the use indicated is not the only one to which the lion puts its tail. When the hunter pursues it closely, the beast *sweeps* its bushy tail about so as to obliterate its foot-prints as it advances, thus eluding annoying or successful pursuit.

You may have seen it stated that all members of the leonine family "sleep with one eye open." This is not a fact, although our mediæval naturalist informs us that for some unknown reason the lion manifests great dread of a white rooster but has none for its brother of colored plu-

mage; and that either from fear of the white rooster, or maybe some other cause, it sleeps with open eyes—both of them, notice. The Romans knew more about the zoology of Africa, at least the north part, than they did of the Orient. The main source of de Thaun's information was Latin. In 1795 Mungo Park, the celebrated explorer, records that in the course of his travels into the interior of Africa, one of his native attendants tied a white chicken to a branch of a certain kind of tree, pronouncing the operation as an offering or sacrifice to the spirits or white birds of the woods, who were a powerful race of beings of a white color.

This old heathen custom was doubtless the origin of the story relative to the lion given by our author to the students of nature nearly seven hundred years before Park recorded his observation in darkest Africa.

Attention is called to this incident only to show the force of myth—how persistently perpetuated and passed as fact from one generation to another for centuries. That story about the "swans a little before their death sing most sweetly," given as a truth in one of our school readers, is a case in point and of modern acceptance by at least many young people in some sections of this country of enlightened school-boards. That story was old and generally believed in the time of Pliny, who said in substance, that "swans are skilful in singing is now rife in every man's mouth, but, for myself, I never heard them sing, and perchance no other man. I am led to think thus by some experiments."

Our author, de Thaun, tells us that the panther is little less wonderful in its habits than the lion. It is a mild and gentle beast, (think of that!) and loved by all the other animals saving the dragon, this monstor, being ugly and unloving in disposition, hates and fears the panther, whose appetite is easily gratified. It eats all kinds of

meat, and having satisfied its hunger takes a three days' sleep. On the third day, it awakens and going to the entrance of its den, utters a loud wail, with which an odor issues; the animals hearing the cry and following the odor gather near the den. The author leaves the impression that the panther then takes his choice from among its charmed victims, and tells us that a terrible fate is inflicted on the dragon, who, as soon as it hears the wail and smells the odor, falls down and commits self-destruction by tearing out its viscera with its tail.

For the benefit of those who never saw a dragon, our author says it was reptilian in form, "crowned with a crest" and winged, had two feet, an ample supply of teeth and a tail which served as a weapon of offence and defence. "And there is a moral to this," says de Thaun, quoting from the theologians of the day: "Tail means end, dragon symbolizes the devil, and the swishing of its tail means that the devil will bring to a miserable and untimely end all those who do not abandon their evil ways." Similar lessons are drawn from the habits and characteristics of each animal described.

The stag—this is the European red deer—is fond of snake-hunting. It seeks a hole where the snake is confined, blows water, from its mouth, into the hole until the snake is flooded out, and then cuts the reptile to death with its hoofs. You have heard the story, or read it in some of the books, about the stag's American cousin, the western deer, springing into the air, massing its four feet and then falling onto the reptile, crushing and cutting it to pieces. Let this be classed with de Thaun's wonderful revelations, or at least taken with some allowance.

Bear this in mind, and as you pass along in your nature study see if your observation don't bear out the statement that animals only destroy other animals for food or in de-

fence of self or kind, and never as a precautionary measure, as some of our would be naturalists teach.

The deer fights the snake, it is true, but only in defence, but that is by pawing, and if a venomous reptile, very cautiously, but savagely and surely. The deer, in the south-west, can "perform the springing act," but it is only in rare instances, and then against snakes that coil for the purpose of striking and defending. It is during this process that the deer, taking the snake at a disadvantage, that the spring and fall are made, as indicated. Do not believe that a deer ever thus jumps onto a rattlesnake after the coiling has been completed. This animal hasn't the "horse-sense" of most men, but it has much more than some.

You have heard and read many marvellous stories about the elephant, some of them true, others not so. The good, old, credulous mediæval naturalists gave the sanction of their authority to the origin of most of these "facts" and careless-thoughted people in modern days accept them. Let's see what our English author, de Thaun says: "The elephant is a beast of understanding, goat shaped, huge of bulk and has teeth of ivory. It has no knee-joint, and so powerful and stout is the beast that it can carry a castle on its back. Because it cannot bend its legs, it will not lie down to sleep, as it would be unable to rise again. When it wants to sleep it rests its back against a wall or bank or tree and rests in this posture." The author further tells us that thus situated the elephant is in danger, for the hunter, finding the sleeping mass, quietly undermines the wall or weakens the support, and the heavy beast pushes over its treacherous support, falls on its side and thus becomes an easy captive, whereupon the captors may secure the monster with cords and thongs. Dean Swift must have had something of this sort in his mind when he had Gulliver captured by the Lilliputians.

De Thaun treats extensively of sea life as also of orni-

thology. Reference to one of each class will suffice. The serra was the sea-serpent of those good old days—eight hundred years ago—and terrified the navigators of that time pretty much as the sailor-boys of this day are "interested" by a floating tree-trunk or a "string raft" of sea-weed. This serra had wings like a bird, had a head like a lion and a tail similar to a fish. When the serra saw a ship it went to it at once, and boldly rising to full height with outstretched wings, it "took the wind from the ship's sails and so held her becalmed."

The birds catalogued and described by de Thaun are as curious and queer as the animals. The asida has two feet like a camel and the wings of a bird. On seeing a certain star that appears each July, it scoops a hole in the unshaded sand and lays its eggs therein. The asida ate and digested iron and stones, "Androvaudus denies this. I deny not but he might see one asida which excluded his iron undigested; but one Swallow makes no Summer." What well known African bird is here described?

Richmond, Ky.

Nature Study Lessons. XXIV.

BY EDWARD J. BURNHAM.

The great order Hymenoptera includes not only the ants, bees and wasps, with some of which every one is familiar, but also many insects which are little if at all known even to the entomologists. In size they range all the way from the clumsy bumble-bee to creatures so small that they hatch, live and grow to full size in the tiny eggs of other insects, or in the bodies of insects themselves so small as scarcely to be seen without the aid of a magnifier.

No one can reasonably expect to make a complete collection of the species of Hymenoptera to be found in his own neighborhood, and in a lifetime, to say nothing of making

exchanges and securing those known to exist in other parts of the world; but it is possible for any boy or girl to make a good beginning in a single summer. Many of them are unable to inflict any injury, but the bees and wasps can sting severely and must, of course, be handled with great care. It is better that very small children should not handle them at all. Even the most experienced collector will not infrequently find himself taken unawares.

The ants are nearly all too small to be placed in a collection without careful mounting by an expert, and they are, moreover, so difficult to classify that it is generally better for young people to watch them as they roam about, or observe them in their nests, and leave them alone. There is one large species, however, the Carpenter Ant, found in wood, which is large enough to be pinned in a collection.

Most ants are wingless, but every species has some members which grow wings and fly about for a day or two. They then bite their wings off close to the body and find a place to make a nest. The Carpenter Ants fly in spring or early summer, and it is easy to have both the winged and the wingless kinds in one collection. Such ants as may be large enough to pin and mount should be placed by themselves and labelled Formicidæ, which is the family name of the typical and most common species of ants.

Everyone knows the bees, but comparatively few people have any idea how many kinds of bees there are. They are very numerous and of all sizes, from that of the big, blundering bumble-bee, which has a home and a family in some deserted nest of the field mouse, to the tiny Halictus, sometimes only one-hundredth of an inch in length. They are to be found about flowers all summer, busily gathering the nectar and the pollen. Some are social, that is, live and work together, as the bumble-bee and

the hive-bee, but the greater number are solitary, each working for herself, mining in the ground or digging out the pith of sumach, berry and brambles, in which they deposit eggs and store up pollen for the young.

While there are many kinds of bees, they can all be grouped in two families by simply examining their tongues, which in all the larger kinds can easily be done with the naked eye. The hive-bees, bumble-bees and carpenter-bees have long tongues, for reaching deep down in flowers, while most of the bees that are solitary, digging holes in the ground or in the pith of shrubs and brambles, have very short tongues. The long-tongued bees belong to the family Apidæ, while the short-tongued bees belong to the family Andrenidæ.

Bees and wasps are somewhat difficult to collect, because they inflict painful wounds with their stings. But they are too interesting to be passed by altogether, and, with the help of a pair of small tweezers, they can be transferred from the insect net to the cyanide or chloroform bottle without much danger. For small children, of course, an older companion should do the collecting.

As with the bees, there are social wasps and solitary wasps. Of the solitary wasps, a few make nests in the pith of dry branches, and some build mud nests, but the larger number burrow in the ground. Nearly all stock their nests with spiders, grasshoppers and other insects, for the young to feed upon.

The social wasps are of two kinds—one building a simple paper nest with a single, uncovered comb; the other building a paper-covered nest with the combs arranged inside in layers. The wasps that make covered nests are commonly known as hornets, or "yellow jackets," and are justly dreaded, for they can sting savagely. Some make their nests in the ground, with a rather weak paper covering; others hang their nests to the branches of trees or

the eaves of buildings. These make a very strong and tough covering of paper for the protection of the colony from the weather. The social wasps, whether they make a single comb or a paper-covered nest, belong to the family Vespidæ.

Of the solitary wasps, there are a great many kinds, and each kind has its own habits of life. There are as many as seven families of these "digger wasps," as they are called, those which children in New England will find most common, provision their nests with spiders. They belong to the family Pompilidæ. In the west and southwest, a kind that stores its nest with grasshoppers is abundant and belongs to the family Laridæ.

All children in the country know the "mud-daubers," that make nests of mud, which they fasten to the under side of stones and in the attics of houses. Most of them stock these mud nests with spiders, and many a child has wondered how the spiders got there. These mud wasps belong to the family Sphecidæ.

The order Hymenoptera is a very large one, and it is impossible in a nature study lesson to more than mention a few of the families, leaving many others to another lesson or until the children have learned more about classification.

Until recently pitchblende has been the only source of radium, but now carnolite, a mineral found in Utah, is found to be a commercial source of the rare element. For some reason it does not seem to possess so much radio-activity as that obtained from pitchblende, but carnolite is henceforth to be regarded as one of the sources of radium.

Here are trees, and bright green grass, and orchards full of contentment, and a man may scarce espy the brook, although he hears it everywhere.—*Lorna Doone.*

The Story of Pike.

BY UNCLE NED.

CHAPTER III.

The season of the year when Pike was hatched was very favorable for him. There was an abundance and variety of food all about him. By the time he had absorbed the yolk-mass upon which he lived and grew at first, the warm water of the lake was swarming with tiny living things.

Not long after he had begun to look about for things to eat and to think a great deal about them, a great shoal of minnows was hatched near by. They were very small indeed, much smaller than Pike was when he was hatched. Not one was more than half an inch long. Each had a big head for so small a fish, and the body tapered back to the end of the tail, which was so thin and small that it seemed to be almost no tail at all. The fishes moved by little wiggles of the whole body, and, all together, headed the same way. There were so many of them, and they crowded so that they looked like a big black patch over the sand in the shallow water.

Pike left off eating wrigglers now, and gave most of his time and attention to these minnows. Indeed, it was fortunate for him that the minnows came when they did, for a queer thing had happened to the wrigglers and they had all gone away.

Pike had become so accustomed to seeing the wrigglers twisting about in the water or resting and breathing at the surface, that he supposed they would always do so.

It never occurred to him that there would come a change some day. If he had learned to notice carefully, as he did afterwards, he would have seen that the wrigglers began to change in shape. They were more clumsy, and

although they could still move about they rested more at the surface of the water than formerly.

At last, one sunny afternoon, when the water was quite still and smooth, a wonderful thing happened to the wrigglers. They were resting, perfectly still, hundreds and thousands of them, at the surface of the water, with their heads upright and their tails hanging downward, when each began to feel the skin splitting open along the back. Soon one of them managed to get his head out, then his legs, and at last his whole body. His empty shell was now like a tiny boat, and he stood on the edge of it, waiting for his wings to stretch and dry. This required little more than half a minute, and then he flew away, a full-fledged mosquito, ready to live on the land, fly about at night, bother people who want to sleep, and make a little nuisance of himself.

By the time this mosquito had flown away, hundreds of others were already standing on tiptoe on their little boats, drying their wings and impatient to follow. As they rose into the air, others were getting ready, and so, for almost all the afternoon, there was a stream of mosquitoes rising from the bog at the mouth of the brook beside the lake.

Once, during the afternoon, a dreadful thing happened. The sun was warm, the water smooth, and the mosquitoes were coming out in great numbers. Thousands were standing on their boats, drying their wings, when a breeze came across the lake and up the brook. It ruffled the water and upset the boats, drowning all those that had got out of their shells but were not yet ready to fly.

It was a very great catastrophe. In different parts of the lake, millions of mosquitoes perished that afternoon because of the breeze that came at just the wrong time for them. It was a greater loss of life than was ever caused by any accident to human beings; but nothing was said

about it in the newspapers. Such things happen so often among the water people that little attention is paid to them. Besides, a great many mosquitoes got away during the afternoon, and those that were drowned were never missed.

The mosquitoes having flown away, or having been drowned, there would be no more wrigglers for nearly a week, and it was very lucky for Pike that the little minnows came. He ate as many as he could of them, sometimes crowding as many as six of them in his little stomach at one time. Of course, he grew very fast.

On this particular afternoon, Pike had just managed to swallow one more minnow, and was lying near the bank, when he heard the little girl say :

"Oh ! how dreadfully thick the mosquitoes are ! "

And the little boy answered :

"Huh ! Just see my legs ! I'm letting 'em fill up."

He meant the mosquitoes on his legs, of course ; and mosquitoes were very thick by the lake that afternoon, and that night at the farm-house, but no one in those days knew where they came from.

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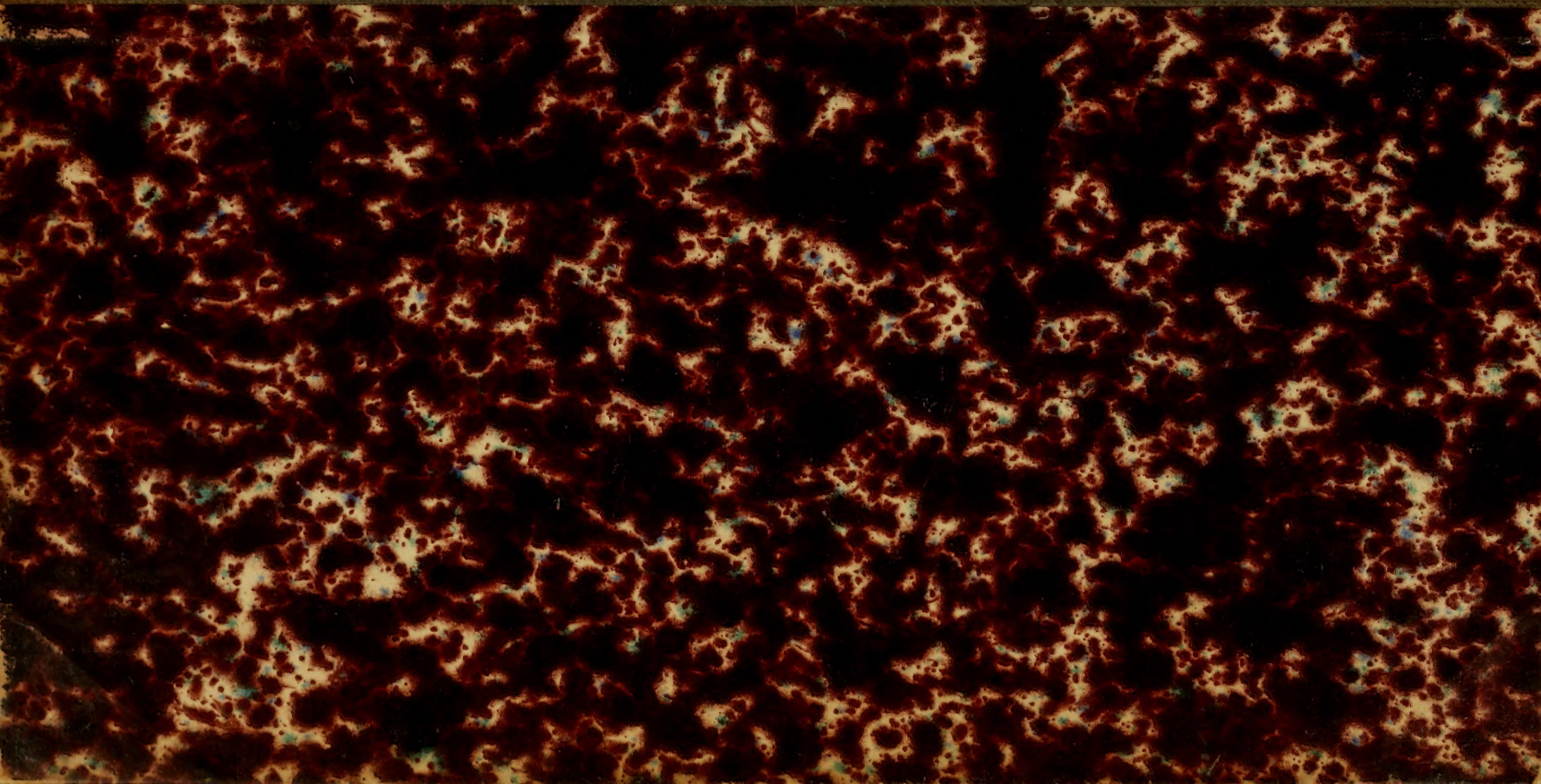
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